2005 Tri-Service Infrastructure Systems Conference & Exhibition

St. Louis, MO
"Re-Energizing Engineering Excellence"

2-4 August 2005

Agenda

***Panel**: The Future of Engineering and Construction*

- LTG Carl A. Strock, Commander, USACE
- Dr. James Wright, Chief Engineer, NAVFAC

***Panel**: USACE Engineering and Construction*

- Dr. Michael J. O'Connor, Director, R&D

***Panel**: Navy General Session*

- Mr. Steve Geusic, Engineering Criteria & Programs NAVFAC Atlantic

Introduction to Multi-Disciplinary Tracks, by Mr. Gregory W. Hughes
Engineering Circular: Engineering Reliability Guidance for Existing USACE Civil Works Infrastructure, by Mr. David M. Schaaf, PE, LRD Regional Technical Specialist, Navigation Engineering Louisville District
MILCON S&A Account Study, by Mr. J. Joseph Tyler, PE, Chief, Programs Integration Division, Directorate of Military Programs HQUSACE
Financial Justification on Bentley Enterprise License Agreement (ELA)

Track 1

- The Chicago Shoreline Storm Damage Reduction Project, by Andrew Benziger
- Protecting the NJ Coast Using Large Stone Seawalls, by Cameron Chasten
- Cascade: An Integrated Coastal Regional Model for Decision Support and Engineering Design, by Nicholas C. Kraus and Kenneth J. Connell
- Modeling Sediment Transport Along the Upper Texas Coast, by David B. King Jr., Jeffery P. Waters and William R. Curtis
- Sediment Compatibility for Beach Nourishment in North Carolina, by Gregory L. Williams
- Evaluating Beachfill Project Performance in the USACE Philadelphia District, by Monica Chasten and Harry Friebel
- US Army Corps of Engineers' National Coastal Mapping Program, by Jennifer Wozencraft
- Flood Damage Reduction Project Using Structural and Non-Structural Measures, by Stacey Underwood
- Shore Protection Project Performance Improvement Initiative (S3P2I), by Susan Durden
- Hurricane Isabel Post-Storm Assessment, by Jane Jablonski
- US Army Corps of Engineers Response to the Hurricanes of 2004, by Rick McMillen and Daniel R. Haubner
- Increased Bed Erosion Due to Increased Bed Erosion Due to Ice, by Decker B. Hains, John I. Remus, and Leonard J. Zabilansky
- Mississippi Valley Division, by James D. Gutshall
- Impacts to Ice Regime Resulting from Removal of Milltown Dam, Clark Fork River, Montana, by Andrew M. Tuthill and Kathleen D. White, and Lynn A. Daniels
- Carroll Island Micromodel Study: River Miles 273.0-263.0, by Jasen Brown
- Monitoring the Effects of Sedimentation from Mount St. Helens, by Alan Donner, Patrick O'Brien and David Biedenharn
  Watershed Approach to Stream Stability and Benefits Related to the Reduction of Nutrients, by John B. Smith
- A Lake Tap for Water Temperature Control Tower Construction at Cougar Dam, Oregon, by Stephen Schlenker, Nathan Higa and Brad Bird
- San Francisco Bay Mercury TMDL – Implications for Constructed Wetlands, by Herbert Fredrickson, Elly Best and Dave Soballe
- Abandoned Mine Lands: Eastern and Western Perspectives, by Kate White and Kim Mulhern
  Translating the Hydrologic Tower of Babel, byDan Crawford
- Demonstrating Innovative River Restoration Technologies: Truckee River, Nevada, by Chris Dunn
- System-Wide Water Resource Management – Tools of the Trade

Track 2

- Ecological and Engineering Considerations for Dam Decommissioning, Retrofits, and Reoperations, by Jock Conyngham
- Hydraulic Design of tidegates and other Water Control structures for Ecosystem Restoration projects on the Columbia River estuary, by Patrick S. O'Brien
- Surface Bypass & Removable Spillway Weirs, by Lynn Reese
- Impacts of using a spillway for juvenile fish passage on typical design criteria, by Bob Buchholz
- Howard Hanson Dam: Hydraulic Design of Juvenile Fish Passage Facility in Reservoir with Wide Pool Fluctuation, by Dennis Mekkers and Daniel M. Katz
- Current Research in Fate Current Research in Fate & Transport of Chemical and Biological Contaminants in Water Distribution Systems, by Vincent F. Hock
- Regional Modeling Requirements, by Maged Hussein
- Tools for Wetlands Permit Evaluation: Modeling Groundwater and Surface Water Interaction, by Cary Talbot
- Ecosystem Restoration for Fish and Wildlife Habitat on the UMRS, by Jon Hendrickson
- Missouri River Shallow Water Habitat Creation, by Dan Pridal
- Aquatic Habitat Restoration in the Lower Missouri River, by Chance Bitner
- Transition to an Oracle Based Data System (Corps Water Management System, CWMS), by Joel Asunskis
- RiverGages.com: The Mississippi Valley Division Water Control Website, by Rich Engstrom
- HEC-ResSim 3.0: Enhancements and New Capabilities, by Fauwaz Hanbali
- Hurricane Season 2004 – Not to Be Forgotten, by Jacob Davis
- Re-Evaluation of a Flood Control Project, by Ferris W. Chamberlin
- Helmand Valley Water Management Plan, by Jason Needham
- A New Approach to Water Management Decision Making, by James D. Barton
- Developing Reservoir Operational Plans to Manage Erosion and Sedimentation during Construction – Willamette Temperature
- Control, Cougar Reservoir 2002-2005, by Patrick S. O'Brien
- Improved Water Supply Forecasts for the Kootenay Basin, by Randal T. Wortman
- ResSIM Model Development for Columbia River System, by Arun Mylvahanan
- Prescriptive Reservoir Modeling and the ROPE, by Jason Needham
- Missouri River Basin Water Management, by Larry Murphy

Track 3

- Corps Involvement in FEMA's Map Modernization Program, by Kate White, John Hunter and Mark Flick
- Innovative Approximate Study Method for FEMA Map Moderniation Program , by John Hunter
- Flood Fighting Structures Demonstration and Evaluation Program (FFSD), by Fred Pinkard
- Integrating Climate Dynamics Into Water Resources Planning and Management, by Kate White
- Hydrologic and Hydraulic Contributions to Risk and Uncertainty Propagation Studies, by Robert Moyer
- Uncertainty Analysis: Parameter Estimation, by Jackie P. Hallberg
- Geomorphology Study of the Middle Mississippi River, by Eddie Brauer
- Bank Erosion and Morphology of the Kaskaskia River, by Michael T. Rodgers
- Degradation of the Kansas City Reach of the Missouri River, by Alan Tool
- Sediment Impact Assessment Model (SIAM), by David S. Biedenharn and Meg Jonas
- Mississippi River Sedimentation Study, by Basil Arthur
- Sediment Model of Rivers, by Charlie Berger
- East Grand Forks, MN and Grand Forks, ND Local Flood Damage Reduction Project, by Michael Lesher
- Hydrologic and Hydraulic Analyses, by Thomas R. Brown
- Hydrologic and Hydraulic Modeling of the Mccook and Thornton Tunnel and Reservoir Plans, by David Kiel
- Ala Wai Canal Project, by Lynnette F. Schaper
- Missouri River Geospatial Decision Support Framework, by Bryan Baker and Martha Bullock
- Systemic Analysis of the Mississippi & Illinois Rivers Upper Mississippi River Comprehensive Plan, by Dennis L. Stephens

Section 227: National Shoreline Erosion Control Demonstration and Development Program Annual Workshop

- Workshop Objectives
- Section 227: Oil Piers, Ventura County, CA, by Heather Schlosser
- An Evaluation of Performance Measures for Prefabricated Submerged Concrete Breakwaters: Section 227 Cape May Point, New Jersey Demonstration Project, by Donald K Stauble, J.B. Smith and Randall A. Wise
- Bluff Stabilization along Lake Michigan, using Active and Passive Dewatering Techniques, by Rennie Kaunda, Eileen Glynn, Ron Chase, Alan Kehew, Amanda Brotz and Jim Selegean
- Storm Damage at Cape Lookout
- Branchbox Breakwater Design at Pickleweed Trail, Martinez, CA
- Section 227: Miami, FL
- Section 227: Sheldon Marsh Nature Preserve
- Section 227: Seabrook, New Hampshire
- Jefferson County, TX – Low Volume Beach Fill
- Sacred Falls, Oahsacred Falls, Oahu Section 227 Demonstration Project

Track 4

- Fern Ridge LakFern Ridge Lake Hydrologic Aspects of Operation during Failure, by Bruce J Duffe
- A Dam Safety Study Involving Cascading Dam Failures, by Gordon Lance
- Spillway Adequacy Analysis of Rough River Lake Louisville District, by Richard Pruitt
- Water Management in Iraq: Capability and Marsh Restoration, by Fauwaz Hanbali
- Iraq Ministry of Water Resources Capacity Building, by Michael J. Bishop, John W. Hunter, Jeffrey D. Jorgeson, Matthew M. McPherson, Edwin A. Theriot, Jerry W. Webb, Kathleen D. White, and Steven C. Wilhelms

- HEC Support of the CMEP Program, by Mark Jensen
- Geospatial Integration of Hydrology & Hydraulics Tools for Multi-Purpose, Multi-Agency Decision Support, by Timothy Pangburn, Joel Schlagel, Martha Bullock, Michael Smith, and Bryan Baker
- GIS & Surveying to Support FEMA Map Modernization and Example Bridge Report, by Mark Flick
- High Resolution Bathymetry and Fly-Through Visualization, by Paul Clouse
- Using GIS and HEC-RAS for Flood Emergency Plans, by Stephen Stello
- High Resolution Visualizations of Multibeam Data of the Lower Mississippi River, by Tom Tobin and Heath Jones
- System Wide Water Resources Program Unifying Technologies Geospatial Applications, by Andrew J. Bruzewicz
- Raystown Plate Locations
- Hydrologic Engineering Center: HEC–HMS Version 3.0 New Features, by Jeff Harris
- SEEP2D & GMS: Simple Tools for Solving a Variety of Seepage Problems, by Clarissa Hansen, Fred Tracy, Eileen Glynn, Cary Talbot and Earl Edris
- Sediment and Water Quality in HEC-RAS, by Mark Jensen
- Advances to the GSSHA Model, by Aaron Byrd and Cary Talbot
- Watershed Analysis Tool: HEC-WAT Program, by Chris Dunn
- Little Calumet River UnsteadLittle Calumet River Unsteady Flow Model Conversion UNET to HEC-RAS, by Rick D. Ackerson
  Kansas River Basin Model, by Edward Parker
- Design Guidance for Breakup Ice Control Structures, by Andrew M. Tuthill
- Computational Hydraulic Model of the Lower Monumental Dam Forebay, by Richard Stockstill, Charlie Berger, John Hite, Alex Carrillo, and Jane Vaughan
- Use of Regularization as a Method for Watershed Model Calibration, by Brian Skahill
- Demonstration Program Urban Flooding and Channel Restoration in Arid and Semi-Arid Regions (UFDP), by Joan Pope, Jack Davis, Ed Sing, John Warwick, Meg Jonas

Track 5

- Walla Walla District Northwestern Division, by Robert Berger
- Best Practices for Conduits through Embankment Dams, by Chuck R. Cooper
- Design, Construction Design, Construction and Seepage at Prado Dam, by Douglas E. Chitwood
- 2-D Liquefaction Evaluation with Q4Mesh, by David C. Serafini
- Unlined Spillway Erosion Risk Assessment, by Johannes Wibowo, Don Yule, Evelyn Villanueva and Darrel Temple
- Seismic Remediation of the Clemson Upper and Lower Diversion Dams; Evaluation, Conceptual Design and Design, by Lee Wooten and Ben Foreman
- Seismic Remediation of the Clemson Upper and Lower Diversion Dams; Deep Soil Mix Construction, by Lee Wooten and Ben Foreman
- Historical Changes in the State of the Art of Seismic Engineering and Effects of those changes on the Seismic Response Studies of Large Embankment Dams, by Sam Stacy
- Iwakuni Runway Relocation Project, by Vincent R. Donnally
- Internal Erosion & Piping at Fern Ridge Dam, by Jeremy Britton
- Rough River Dam Safety Assurance Project, by Timothy M. O’Leary
- Seepage Collection & Control Systems: The Devil is in the Details , by John W. France
- Dewey Dam Seismic Assessment, by Greg Yankey
- Seismic Stability Evaluation for Ute Dam, New Mexico, by John W. France
- An Overview of Criteria Used by Various Organizations for Assessment and Seismic Remediation of Earth Dams, by Jeffrey S. Dingrando
- A Review of Corps of Engineers Levee Seepage Practices and Proposed Future Changes, by George Sills
- Ground-Penetrating Radar Applications for the Assessment of Pavements, by Lulu Edwards and Don R. Alexander
- Peru Road Upgrade Project, by Michael P. Wielputz
- Slope Stability Evaluation of the Baldhill Dam Right Abutment, by Neil T. Schwanz
- Design and Construction of Anchored Bulkheads with Synthetic Sheet Piles Seabrook, New Hampshire, by Siamac Vaghar and Francis Fung
- Characterization of Soft Claya Case Study at Craney Island, by Aaron L. Zdinak
- Dispersive ClayDispersive Clays – Experience andHistory of the NRCS (Formerly SCS), by Danny McCook
- Post-Tensioning Institute, by Michael McCray
- Demonstration Program Urban Flooding and Channel Restoration in Arid and Semi-Arid Regions (UFDP), by Joan Pope, Jack Davis, Ed Sing, John Warwick, Meg Jonas

Track 6

- State of the Art in Grouting: Dams on Solution Susceptible or Fractured Rock Foundations, by Arthur H. Walz
- Specialty Drilling, Testing, and Grouting Techniques for Remediation of Embankment Dams, by Douglas M. Heenan
- Composite Cut-Offs for Dams, by Dr. Donald A. Bruce and Trent L. Dreese
- State of the Art in Grout Mixes, by James A. Davies
- State of the Art in Computer Monitoring and Analysis of Grouting, by Trent L. Dreese and David B. Wilson
- Quantitatively Engineered Grout Curtains, by David B. Wilson and Trent L. Dreese
- Grout Curtains at Arkabutla Dam: Outlet Monolith Joints and Cracks using Chemical Grout, Arkabutla Lake, MS, by Dale A. Goss
- Chicago Underflow Plan – CUP: McCook Reservoir Test Grout Program, by Joseph A. Kissane
- Clearwater Dam: Sinkhole Repair Foundation Investigation and Grouting Project, by Mark Harris
- Update on the Investigation of the Effects of Boring Sample Size (3” vs 5”) on Measured Cohesion in Soft Clays, by Richard Pinner and Chad M. Rachel
- Soil-Bentonite Cutoff Wall Through Free-Product at Indiana Harbor CDF, by Joe Schulenberg and John Breslin
- Soil-Bentonite Cutoff Wall Through Dense Alluvium with Boulders into Bedrock, McCook Reservoir, by William A. Rochford
- Small Project, Big Stability Problem the Block Church Road Experience, by Jonathan E. Kolber
- Determination of Foundation Rock Properties Beneath Folsom Dam, by Michael K. Sharp, José L. Llopis and Enrique E. Matheu
  Waterbury Dam Mitigation, by Bethany Bearmore
- Armor Stone Durability in the Great Lakes Environment, by Joseph A. Kissane
- Mill Creek - An Urban Flood Control Challenge, by Monica B. Greenwell
- Next Stop, The Twilight Zone, by Troy S. O’Neal
- Limitations in the Back Analysis of Shear Strength from Failures, by Rick Deschamps and Greg Yankey
- Reconstruction of Deteriorated Concrete Lock Walls After Blasting and Other Demolition Removal Techniques, by Stephen G. O'Connor

- Flood Fighting Structures Demonstration and Evaluation Program (FFSD), by George Sills
- Innovative Design Concepts Incorporated into a Landfill Closure and Reuse Design Portsmouth Naval Shipyard, Kittery, Maine, by Dave Ray and Kevin Pavlik
- Laboratory Testing of Flood Fighting Structures, by Johannes L. Wibowo, Donald L. Ward and Perry A. Taylor
- Bluff Stabilization Along Lake Michigan, Using Active and Passive Dewatering Techniques, Allegan Co. Michigan, by Rennie Kaunda, Eileen Glynn, Ron Chase, Alan Kehew and Jim Selegean

Track 7

- Case History: Multiple Axial Statnamic Tests on a Drilled Shaft Embedded in Shale, by Paul J. Axtell, J. Erik Loehr, Daniel L. Jones
- The Sliding Failure of Austin Dam Pennsylvania - Revisited, by Brian H. Greene
- M3 –Modeling, Monitoring and Managing: A Comprehensive Approach to Controlling Ground Movements for Protection of Existing Structures and Facilities, by Francis D. Leathers and Michael P. Walker
- Time-Dependent Reliability Modeling for Use in Major Rehabilitation of Embankment Dams and Foundation, by Robert C. Patev
- Lateral Pile Load Test Results Within a Soft Cohesive Foundation, by Richard J. Varuso
- Engineering Geology Challenge Engineering Geology Challenges During Design and Construction of the Marmet Lock Project, by Ron Adams and Mike Nield
- Mill Creek Deep Tunnel Geologic Conditions and Potential Impacts on Design/Construction, by Kenneth E. Henn III
- McAlpine Lock Replacement Instrumentation: Design, Construction, Monitoring, and Interpretation, by Troy S. O'Neal
- Geosynthetics and Construction of the Second Powerhouse Corner Collector Surface Flow Bypass Project, Bonneville Lock and Dam Project, Oregon and Washington, by Art Fong
- McAlpine Lock Replacement Project Foundation Characteristics and Excavation, by Kenneth E. Henn III
- Structural and Geotechnical Issues Impacting The Dalles Spillwall Construction and Bay 1 Erosion Repair, by Jeffrey M. Ament
  Rock Anchor Design and Construction: The Dalles Dam Spillwalls, by Kristie M. Hartfeil
- The Future of the Discrete Element Method in Infrastructure Analysis, by Raju Kala, Johannes L. Wibowo and John F. Peters
- Sensitive Infrastructure Sites - Sonic Drilling Offers Quality Control and Non-Destructive Advantages to Geotechnical Construction Drilling, by John P. Davis

Track 8

- Evaluation of The Use of LithiuEvaluation of The Use of Lithium Compounds in Controlling ASR in Concrete Pavement, by Mike Kelly
- Roller Compacted Concrete for McAlpine Lock Replacement, by David E. Kiefer
- Soil-Cement for Stream Bank Stabilization, by Wayne Adaska
- Using Cement to Reclaim Asphalt Pavements, by David R. Luhr
- Valley Park 100-Yr Flood Protection Project: Use of 'Engineered Fill' in the Item IV-B Levee Core, by Patrick J. Conroy
- Bluestone Dam: AAR –A Case Study, by Greg Yankey
- USDA Forest Service: Unpaved Road Stabilization with Chlorides, by Michael R. Mitchell
- Use of Ultra-Fine Amorphous Colloidal Silica to Produce a High-Density, High-Strength Grout, by Brian H. Green
- Modular Gabion Systems, by George Ragazzo
- Addressing Cold Regions Issues in Pavement Engineering, by Edel R. Cortez and Lynette Barna
- Geology of New York Harbor: Geological and Geophysical Methods of Characterizing the Stratigraphy for Dredging Contracts, by Ben Baker, Kristen Van Horn and Marty Goff
- Rubblization of Airfield Concrete Pavements, by Eileen M. Vélez-Vega
- US Army Airfield Pavement Assessment Program, by Haley Parsons, Lulu Edwards, Eileen Velez-Vega and Chad Gartrell
- Critical State for Probabilistic Analysis of Levee Underseepage, by Douglas Crum,
- Curing Practices for Modern Concrete Production, by Toy Poole
- AAR at Carters Dam: Different Approaches, by James Sanders
- Concrete Damage at Carters Dam, by Toy Poole
  Damaging Interactions Among Concrete Materials, by Toy Poole
- Economic Effects on Construction of Uncertainty in Test Methods, by Toy Poole
- Trends in Concrete Materials Specifications, by Toy Poole
- Spall and Intermediate-Sized Repairs for PCC Pavements, by Reed Freeman and Travis Mann
- Acceptance Criteria Acceptance Criteria for Unbonded Aggregate Road Surfacing Materials, by Reed Freeman, Toy Poole, Joe Tom and Dale Goss
- Effective Partnering to Overcome an Interruption In the Supply of Portland Cement During Construction at Marmet Lock and Dam, by Billy D. Neeley, Toy S. Poole and Anthony A. Bombich

Track 10

- Marmet Lock &Dam: Automated Instrumentation Assessment, Summer/Fall 2004, by Jeff Rakes and Ron Adams
  Success Dam Seismic Remediation

Track 9

- Fern Ridge Dam, Oregon: Seepage and Piping Concerns (Internal Erosion)

Track 11

- Canton Dam Spillway Stability: Is a Test Anchor Program Necessary?, by Randy Mead
- Dynamic Testing and Numerical Correlation Studies for Folsom Dam, by Ziyad Duron, Enrique E. Matheu, Vincent P. Chiarito, Michael K. Sharp and Rick L. Poeppelman

- Status of Portfolio Risk Assessment, by Eric Halpin
- Mississinewa Dam Foundation Rehabilitation, by Jeff Schaefer
- Wolf Creek Dam Seepage Major Rehabilitation Evaluation, by Michael F. Zoccola
- Bluestone Dam DSA Anchor Challenges, by Michael McCray
- Clearwater Dam Major Rehab Project, by Bobby Van Cleave
- Design, Construction and Seepage at Prado Dam, by Douglas E. Chitwood
- Seven Oaks Dam: Outlet Tunnel Invert Damage, by Robert Kwan
- An Overview of An Overview of the Dam Safety ProgramManagement Tools (DSPMT), by Tommy Schmidt

Track 12

- Greenup L&D Miter Gate Repair and Instrumentation, by Joseph Padula, Bruce Barker and Doug Kish
- Marmet Locks and Dam Lock Replacement Project, by Jeffrey S. Maynard,
- Status of HSS Inspections in The Portland District, by Travis Adams
- Kansas City District: Perry Lake Project Gate Repair, by Marvin Parks
- Mel Price – Auxiliary Lock Downstream Miter Gate Repair, by Thomas J. Quigley, Brian K. Kleber and Thomas R. Ruf
- J.T. Myers Lock Improvements Project Infrastructure Conference, by David Schaaf and Greg Werncke
- J.T. Myers Dam Major Rehab, by David Schaaf, Greg Werncke and Randy James
- Greenup L&D, by Rodney Cremeans
- McAlpine Lock Replacement Project, by Kathy Feger
- Roller Compacted Concrete Placement at McAlpine Lock, by Larry Dalton
- Kentucky Lock Addition Downstream Middle Wall Monolith Design, by Scott A. Wheeler
- London Locks and Dam Major Rehabilitation Project, by David P. Sullivan
- Replacing Existing Lock 4: Innovative Designs for Charleroi Lock, by Lisa R. Pierce, Dave A. Stensby and Steve R. Stoltz
- Olmsted L&D, Dam In-the-wet Construction, by Byron McClellan, Dale Berner and Kenneth Burg
- Olmsted Floating Approach Walls, by Terry Sullivan
- John Day Navigation Lock Monolith Repair, by Matthew D. Hanson
- Inner Harbor Navigation Canal (IHNC) Lock Replacement, by Mark Gonski
- Comite River Diversion Project, by Christopher Dunn
- Waterline Support Failure: A Case Study, by Angela DeSoto Duncan
- Public Appeal of Major Civil Projects: The Good, the Bad and the Ugly, by Kevin Holden and Kirk Sunderman
- Chickamauga Lock and Dam Lock Addition Cofferdam Height Optimization Study, by Leon A. Schieber
- Des Moines Riverwalk, by Thomas D. Heinold

Track 13

- Folsom Dam Evaluation of Stilling Basin Performance for Uplift Loading for Historic Flows and Modification of Folsom Dam
- Stilling Basin for Hydrodynamic Loading, by Rick L. Poeppelman, Yunjing (Vicky) Zhang, and Peter J. Hradilek
- Seismic Stress Analysis of Folsom Dam, by Enrique E. Matheu
- Barge Impact Analysis for Rigid Lock Walls ETL 1110-2-563, by John D. Clarkson and Robert C. Patev
- Belleville Locks & Dam Barge Accident on 6 Jan 05, by John Clarkson
- Portugues Dam Project Update, by Alberto Gonzalez, Jim Mangold and Dave Dollar
- Portugues Dam: RCC Materials Investigation, by Jim Hinds
- Nonlinear Incremental Thermal Stress Strain Analysis Portugues Dam, by David Dollar, Ahmed Nisar, Paul Jacob and Charles Logie
- Seismic Isolation of Mission-Critical Infrastructure to Resist Earthquake Ground Shaking or Explosion Effects, by Harold O. Sprague, Andrew Whitaker and Michael Constantino
- Obermeyer Gated Spillway S381, by Michael Rannie
- Design of High Pressure Vertical Steel Gates Chicago Land Underflow Plan McCook Reservoir, by Henry W. Stewart, Hassan Tondravi, Lue Tekola,
- Development of Design Criteria for the Rio Puerto Nuevo Contract 2D/2E Channel Walls, by Janna Tanner, David Shiver, and Daniel Russell
- Indianapolis NortIndianapolis North Phase 3A Warfleigh Section
- Design of Concrete Lined Tunnels in Rock CUP McCook Reservoir Distribution Tunnels Contract, by David Force

Track 14

- GSA Progressive Collapse Design Guidelines Applied to Concrete Moment-Resisting Frame Buildings, by David N. Bilow and Mahmoud E. Kamara,
- UFC 4-023-02 Retrofit of Existing Buildings to Resist Explosive Effects, by Jim Caulder
- Summit Bridge Fatigue Study, by Jim Chu
- Quality Assurance for Seismic Resisting Systems, by John Connor
- Seismic Requirements for Arch, Mech, and Elec. Components, by John Connor
- SBEDS - (Single degree of freedom Blast Effects Design Spreadsheets), by Dale Nebuda,
- Design of Buildings to Resist Progressive Collapse UFC 4-023-03, by Bernie Deneke,
- Fatigue and Fracture Assessment, by Jesse Stuart
- Unified Facilities Criteria: Seismic Design for Buildings, by Jack Hayes
- Evaluation and Repair Of Blast Damaged Reinforced Concrete Beams, by MAJ John L. Hudson
- Building an In-house Bridge Inspection Program
- United Facilities CriteriUnited Facilities Criteria Masonry Design for Buildings, by Tom Wright
- USACE Homeland Security Portal, by Michael Pace
- Databse Tools for Civil Works Projects

- Standard Procedure for Fatigue Evaluation of Bridges, by Phil Sauser
- Consolidation of Structural Criteria for Military Construction, by Steven Sweeney
- Cathodic Protectionfor the South Power Plant Reinforcing Steel, Diego Garcia, BIOT, by Thomas Tehada and Miki Funahashi

Track 15

- Engineering Analysis of Airfield Lighting System Lightning Protection, by Dr. Vladimir A. Rakov and Dr. Martin A. Uman
- Dr. Martin A. Uman
- Charleston AFB Airfield Lighting Vault
- UNIFIED FACILITIES CRITERIA (UFC) UFC 3-530-01 Design: Interior, Exterior Lighting and Controls, by Nancy Clanton and Richard Cofer
- Electronic Keycard Access Locks, by Fred A Crum
- Unified Facilities Criteria (UFC) 3-560-02, Electrical Safety, by John Peltz and Eddie Davis
- Electronic Security SystemElectronic Security Systems Process Overview
- Lightning Protection Standards
- Electrical Military Workshop
- Information Technology Systems Criteria, by Fred Skroban and John Peltz
- Electrical Military Workshop
- Electrical Infrastructure in Iraq- Restore Iraqi Electricity, by Joseph Swiniarski

Track 16

- BACnet® Technology Update, by Dave Schwenk
- The Infrastructur Conference 2005, by Steven M. Carter Sr. and Mitch Duke
- Design Consideration for the Prvention of Mold, by K. Quinn Hart
- COMMISSIONING, by Jim Snyder
- New Building Commissioning , by Gary Bauer
- Ventilation and IAQ TheNew ASHRAE Std 62.1, by Davor Novosel
- Basic Design Considerations for Geothermal Heat Pump Systems, by Gary Phetteplace
- Packaged Central Plants
- Effective Use Of Evaporative Cooling For Industrial And Institutional/Office Facilities, by Leon E. Shapiro
- Seismic Protection For Mechanical Equipment
- Non Hazardous Chemical Treatments for Heating and Cooling Systems, by Vincent F. Hock and Susan A. Drozdz
- Trane Government Systems & Services
- LONWORKS Technology Update, by Dave Schwenk
- Implementation of Lon-Based Specifications by Will White and Chris Newman

Track 17

- Utility System Security and Fort Future, by Vicki Van Blaricum, Tom Bozada, Tim Perkins, and Vince Hock
- Festus/Crystal City Levee and Pump Station
- Chicago Underflow Plan McCook Reservoir (CUP) Construction of Distribution Tunnel and Pumps Installation
- Technological Advances in Lock Control Systems, by Andy Schimpf and Mike Maher
- Corps of Engineers in Iraq Rebuilding Electrical Infrastructure, by Hugh Lowe
- Red River of the North at East Grand Forks, MN & Grand Forks, ND: Flood Control Project – Armada of Pump Stations Protect Both Cities, by Timothy Paulus
- Lessons Learned for Axial/Mixed Flow Propeller Pumps, by Mark A. Robertson
- Creek Automated Gate Considerations, by Mark A. Robertson
- HydroAMP: Hydropower Asset Management, by Lori Rux
- Acoustic Leak Detection for Water Distribution Systems, by Sean Morefield, Vincent F. Hock and John Carlyle
- Remote Operation System, Kaskaskia Dam Design, Certification, & Accreditation, by Shane M. Nieukirk
- Lock Gate Replacement System, by Shaun A. Sipe and Will Smith

Track 20

- “Re-Energizing Medical Facility Excellence”, by COL Rick Bond
- Rebuilding and Renovating The Pentagon , by Brian T. Dziekonski,
- Resident Management System
- Design-Build and Army Military Construction, by Mark Grammer
- Defense Acquisition Workforce Improvements Act - Update, by Mark Grammer
- Construction Management @ Risk: Incentive Price Revision – Successive Targets, by Christine Hendzlik
- Construction Reserve Matrix, by Christine Hendzlik
- Award contingent on several factors..., by Christine Hendzlik
- 52.216-17 Incentive Price Revision--Successive Targets (Oct 1997) - Alt I (Apr 1984), by Christine Hendzlik
- Preconstruction Services, by Christine Hendzlik
- Proposal Evaluation Factors, by Christine Hendzlik
- MILCON Transformation in Support of Army Transformation, by Claude Matsui
- Construction Practices in Russia, by Lance T. Lawton

- Partnering as a Best Practice, by Ray Dupont
- USACE Tsunami Reconstruction for USAID, by Andy Constantaras

Track 21

- Dredging Worldwide, by Don Carmen
- SpecsIntact Editor, by Steven Freitas
- SpecsIntact Explorer, by Steven Freitas
- American River Watershed Project, by Steven Freitas
- Unified Facilities Guide Specifications (UFGS) Conversion To MasterFormat 2004, by Carl Kersten
- Unified Facilities Guide Specifications (UFGS) Status and Direction , by Jim Quinn

Workshops

- Design of Buildings to Resist Progressive Collapse UFC 4-023-03, by Bernie Deneke
- Security Engineering and at Unified Facility Criteria (UFC), by Bernie Deneke, Richard Cofer, John Lynch and Rudy Perkey
- Packaged Central Plants, by Trey Austin

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION

STRENGTH THROUGH INDUSTRY & TECHNOLOGY

2005 Tri-Service Infrastructure Systems Conference & Exhibition

"Re-Energizing Engineering Excellence"

ON-SITE AGENDA

The America's Center
St. Louis Convention Center
St. Louis, MO
August 2-4, 2005
Event # 5150

Tri-Service Infrastructure Systems Conference & Exposition 2005

AGENDA

Monday, August 1, 2005

8:00 AM-9:00 PM	Exhibit Move-In
12 Noon-5:00 PM	Registration

Tuesday, August 2, 2005

7:00 AM-8:00 AM	Registration and Continental Breakfast
8:00 AM-8:15 AM Ferrara Theatre	Welcome and Introduction
8:15 AM-9:00 AM Ferrara Theatre	The Future of Engineering and Construction Panel Moderator: *Mr. Don Basham, Chief, Engineering & Construction, USACE* Panelists: *LTG Carl A. Strock, Commander, USACE* *Dr. James Wright, Chief Engineer NAVFAC*
9:00 AM-9:45 AM Ferrara Theater	Keynote Address The Lord of the Things: The Future of Infrastructure Technologies *Mr. Paul Doherty, AIA, Managing Director,* *General Land Corporation*
9:45 AM-10:15 AM	Break
10:15 AM-11:15 AM Ferrara Theatre	USACE Engineering and Construction Panel Moderator: *Mr. Don Basham, Chief, Engineering & Construction, USACE* Panelists: *MG Donald T. Riley, Director, Civil Works, USACE* *BG Bo M. Temple, Director, Military Programs, USACE* *Dr. Michael J. O'Connor, Director, R&D*
10:15 AM-11:15 AM Room 225	Navy General Session
11:00 AM - 7:00 PM	Exhibits Open
11:15 AM-1:00 PM	Lunch in Exhibit Hall (on your own)
11:15 AM-1:00 PM Washington G	Women's Career Lunch Session (Bring your lunch from Exhibit Hall) Moderator: *Ms. Demi Syriopoulou, HQ USACE* Opening Remarks: *LTG Carl A. Strock, Commander, USACE* Presentations & Discussion: *Dwight Beranek, Kristine Allaman, Donald Basham, HQ USACE*
1:00 PM-1:55 PM Ferrara Theatre	Introduction to Multi-Disciplinary Tracks

Tuesday, August 2, 2005

2:00 PM-2:50 PM — 1st Round of Multi-Disciplinary Concurrent Sessions (Continued)

Track 1: Acquisition Strategies for Civil Works
Room 230
Walt Norko

Track 2: Risk and Reliability Engineering
Room 231
Anjana Chudgar
David Schaaf

Track 3: Portfolio Risk Assessment
Room 232
Eric Halpin

Track 4: Hydrology, Hydraulics and Coastal Engineering Support for USACE
Room 240
Jerry Webb
Darryl Davis

Track 5: Civil Works R&D Forum
Room 241
Joan Pope

Track 6: Civil Works Security Engineering
Room 242
Joe Hartman
Bryan Cisar

Track 7: Building Information Model Applications
Room 226
Brian Huston
Daniel Hawk

Track 8: Design Build for Military Projects
Room 220
Mark Grammer

Track 9: Army Transformation/Global Posture Initiative/ Force Modernization
Room 221
Al Young
Claude Matsui

Track 10: Force Protection - Army Access Control Points
Room 222
John Trout

Track 11: Cost Engineering Forum on Government Estimates vs. Actual Costs
Room 227
Ray Lynn *Jack Shelton* *Kim Callan*
Miguel Jumilla *Ami Ghosh* *Joe Bonaparte*

Track 12: Engineering & Construction Information Technology
Room 228
MK Miles

Track 13: Sustainable Design
Room 223
Harry Goradia

Track 14: ACASS/CCASS/CPARS
Room 224
Ed Marceau
Marilyn Nedell

Track 15: Whole Building Design Guide
Room 229
Earle Kennett

Tuesday, August 2, 2005

2:50 PM-3:30 PM	Break in Exhibit Hall
3:30 PM-4:20 PM	2nd Round of Multi-Disciplinary Sessions
4:30 PM-5:20 PM	3rd Round of Multi-Disciplinary Sessions
5:30 PM-7:00 PM	Ice Breaker Reception in Exhibit Hall

Wednesday, August 3, 2005

7:00 AM-8:00 AM	Registration and Continental Breakfast
8:00 AM-9:30 AM	Concurrent Sessions (Please Refer to Concurrent Session Schedule on the Following Pages)
9:00 AM	Exhibit Hall Opens
9:30 AM-10:30 AM	Break in Exhibit Hall
10:30 AM-12:00 Noon	Concurrent Sessions (Please Refer to Concurrent Session Schedule on the Following Pages)
12:00 Noon-1:30 PM	Lunch in Exhibit Hall
1:30 PM-3:00 PM	Concurrent Sessions (Please Refer to Concurrent Session Schedule on the Following Pages)
3:00 PM-4:00 PM	Break in Exhibit Hall
4:00 PM-5:30 PM	Concurrent Sessions
5:00 PM	Exhibit Hall Closes

Thursday, August 4, 2005

7:00 AM-8:00 AM	Registration and Continental Breakfast
8:00 AM-9:30 AM	Concurrent Sessions (Please Refer to Concurrent Session Schedule on Following Pages)
9:30 AM-10:30 AM	Break in Exhibit Hall (Last Chance to view Exhibits)
10:30 AM-12:00 Noon	Concurrent Sessions (Please Refer to Concurrent Session Schedule on Following Pages)
12:00 Noon-1:30 PM	Lunch (On your own)
12:00 Noon-6:00 PM	Exhibits Move-Out
1:30 PM-3:00 PM	Concurrent Sessions (Please Refer to Concurrent Session Schedule on Following Pages)
3:00 PM-3:30 PM	Break
3:30 PM-5:00 PM	Concurrent Sessions (Please Refer to Concurrent Session Schedule on following pages)

Wednesday, August 3, 2005 Concurrent Sessions

HH&C Track

Room	Track / Session	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:30 AM	11:00 AM	11:30 AM
Room 220	**TRACK 1** Coastal Structures — Session 1A	Protecting the NJ Coast using large stone seawalls — *Cameron Chasten*	Chicago shoreline storm damage reduction project — *Andrew Bezinger*	Risk and reliability in coastal structure design — *Jeffrey Melby*	Break in Exhibit Hall			
	TRACK 1 Coastal Regional Manangement — Session 1B					Cascade: An integrated regional model for decision support — *Nicholas Kraus*	Upper Texas coast sediment transport modeling & sediment budgets — *David King*	Sediment compatibility for beach nourishment in North Carolina — *Gregory Williams*
Room 221	**TRACK 2** Ecological Engineering & Design — Session 2A	Ecological and engineering considerations for dam decommissioning, retrofits and operations — *Jock Conyngham*	Hydraulic design of tidegates and other water control structures for ecosystem restoration on the Columbia Estuary — *Patrick O'Brien*	Innovative Integration of engineering and biological tools aids hydraulic structure design for restoring T&E fish — *Andrew Goodwin*	Break in Exhibit Hall			
	TRACK 2 Ecological Engineering & Design — Session 2B					Innovative hydraulic structure design at Lower Granite Dam: design that saves water and salmon — *Lynn Reese*	Impacts of using a spillway for juvenile fish passage on typical design criteria — *Robert Buchholz*	Hydraulic design of juvenile fish passage facility for reservoir with wide range of pool elevation - Hanson Dam — *Dennis Mekkers*
Room 222	**TRACK 3** Modeling — Session 3A	Corps involvement in the FEMA map modernization program — *Kete White*	Innovative approximate study method for FEMA map modernization program — *John Hunter*	Flood fight structures demonstration evaluation program — *Fred Pinkard*	Break in Exhibit Hall			
	TRACK 3 Modeling — Session 3B					Integrating climate dynamics into water resources planning and management — *Kate White*	Risk and uncertainty in flood damage reduction studies — *Rob Moyer*	Uncertainty analysis and stochastic simulation — *Jacke Hallberg*
Room 223	**TRACK 4** H&H Aspects of Dam Safety — Session4A	Hydrologic aspects of operating in failure mode: Fern Lake — *Bruce Duffe*	Dam safety study with cascading failures — *Gordon Lance*	Rough river spillway capacity — *Richard Pruitt*	Break in Exhibit Hall			
	TRACK 4 International/ Military H&H — Session 4B					Capability restoration and historic marsh restoration — *Fauwaz Hanbali*	USACE capacity building effort for Iraq MoWR — *Steven Wilhelms*	USACE support of CMEP in 2004 — *Mark Jensen*

12 Noon — Lunch in Exhibit Hall

Room	Track / Session	1:30 PM	2:00 PM	2:30 PM	3:00 PM	4:00 PM	4:30 PM	5:00 PM
Room 220	**TRACK 1** Coastal Sediments — Session 1C	Evaluating beachfill project performance in the NAP — *Monica Chasten*	USACE's regional coastal mapping program — *Jennifer Wozencraft*	US Naval Academy flood damage reduction project using structural and non-structural measures — *Stacey Underwood*	Break in Exhibit Hall			
	TRACK 1 Shore Protection Projects — Session 1D					Hurricane Isabel effects on communities — *Jane Jablonski*	Repair of the shore protection projects adversly affected by the hurricanes of 2004 — *Rick McMillen*	Shore protection project performance assessmet — *Sharon Haggett*
Room 221	**TRACK 2** Modeling Ecological Restoration/Systems Assessment — Session 2C	Regional modeling requirements for ecosystem restoration — *Maged Hussein*	Tools for wetlands permit evaluation: Modeling groundwater and surface water distribution systems — *Cary Talbot*	Current research in fate and transport of chemical and biological contaminants in water distribution systems — *Mark Ginsberg*	Break in Exhibit Hall			
	TRACK 2 Ecosystem Habitat Restoration — Session 2D					Aquatic habitat restoration in the lower Missouri River — *Chance Bittner*	Missouri River restoration: shallow water habitat creation — *Daniel Pridal*	Ecosystem restoration for fish and wildlife habitat on the upper Mississippi River — *Jon Hendrickson*
Room 222	**TRACK 3** River Morphology — Session 3C	Geomorphology study of the Mississippi river — *Edward Braurer*	Bank erosion and morphology of the Kaskaskia river — *Michael Rodgers*	Sediment movement at Kansas City from water years 1920 to 2004 — *Alan Tool*	Break in Exhibit Hall			
	TRACK 3 Modeling River Sedimentation — Session 3D					Sediment impact assessment model (SIAM) — *David Biedenharn*	Sediment modeling of MS River, Cairo to Gulf — *Basil Arthur*	Sediment modeling of rivers — *Charlie Berger*
Room 223	**TRACK 4** GIS and Surveying — Session 4C	GIS tools available now to support HHC — *Timothy Pangburn*	High resolution bathymetry and fly-through visualization — *Paul Clouse*	GIS & surveying to support national FEMA — *Mark Flick*	Break in Exhibit Hall			
	TRACK 4 GIS and Surveying — Session 4D					Update flood emergency plans with GIS and HEC-RAS — *Stephen Stello*	High resolution visualizations of multibeam data: lower Mississippi River — *Thomas Tobin*	GIS in SWWRP — *Andrew Bruzewicz*

Wednesday, August 3, 2005 Concurrent Sessions

Geotechnical Track

Room	Track / Session	8:00 AM	8:30 AM	9:00 AM	9:30 AM	10:30 AM	11:00 AM	11:30 AM
Room 226	TRACK 5 Session 5A / 5B	Levee lowering for the Lewis & Clark bi-centennial celebration *Robert Berger*	Conduits through embankment dams - best practices for design, construction, problem id and evaluation, inspection, maintenance, renovation & repair *Dave Pezza*	Design, construction and seepage at Prado Dam, CA *Douglas Chitwood*	Break in Exhibit Hall	2-D liquefaction evaluation with q4MESH *David Serafini*	Unlined spillway erosion risk assessment *Johannes Wibowo*	Seismic remediation of the Clemson upper and lower diversion dams: evaluation, conceptal design and design (P1) *Ben Foreman*
Room 227	TRACK 6 Session 6A / 6B	USACE dams on solution susceptible or highly fractured rock foundations *Art Walz*	Special drilling and grouting techniques for remedial work in embankment dams *Doug Heenan*	Composite grouting & cutoff wall solutions *Donald Bruce*	Break in Exhibit Hall	State of the art in grout mixes *James Davies*	State of the art in computer monitoring, control, and analysis of grouting *Trent Dreese*	Quantitatively engineered grout courtains *David Wilson*
Room 228	TRACK 7 Session 7A / 7B	Case history: multiple axial statnamic test on a drilled shaft embedded in shale *Paul Axtell*	Austin Dam, Pennsylvania: the sliding failure of a concrete gravity dam revisited *Brian Greene*	M^3 (Modeling, Monitoring and Manufacturing) - a comprehensive approach to controlling ground movements for protecting existing structures and facilities *Michael Walker*	Break in Exhibit Hall	Controlled modulus columns: A ground improvement technique *Martin Taube*	Time-dependent reliability models for use in major rehabilitation of embankment dams and foundations *Robert Patev*	Engineering geology design challenges at the Soo Lock replacement project *Mike Nield*
Room 229	TRACK 8 Session 8A / 8B	Evaluation of the use of lithium nitrate in controlling alkali-silica reactivity in an existing concrete pavement *Mike Kelly*	Use of self-consolidating concrete in the installation of bulhead slots - Lessons learned in the use of this innovative concrete material *Darrell Morey*	Roller compacted concrete for McAlpine lock walls *David Kiefer*	Break in Exhibit Hall	Soil-cement for stream bank stabilization *Wayne Adaska*	Using cement to reclaim asphalt pavements *David Luhr*	Valley park 100-year flood protection project: use of "engineered fill" in item 4b levee core *Patrick Conroy*

12 Noon **Lunch in Exhibit Hall**

Room	Track / Session	1:30 PM	2:00 PM	2:30 PM	3:00 PM	4:00 PM	4:30 PM	5:00 PM
Room 226	TRACK 5 Session 5C / 5D	Seismic remediation of the Clemson upper and lower diversion dams: deep soil mix construction *Ben Foreman*	Historical changes in the state-of-the-art of seismic engineering & effects of those changes on the seismic response studies of large embankement dams *Samuel Stacy*	New Iwakuni runway *Vincent Donnally*	Break in Exhibit Hall	Internal erosion and piping at Fern Ridge dam: Problems and solutions *Jeremy Britton, Ph.D.*	Rough river dam safety assurance project *Timothy O'Leary*	Seepage collection and control systems: The devil is in the details *John France*
Room 227	TRACK 6 Session 6C / 6D	Grout courtains at Arkabutla Dam outlet monolith joints using chemical grout to seal joints, Arkabutla, MS *Dale Goss*	Results from a large-scale grout test program, Chicago underflow plan (CUP) McCook Reservoir *Joseph Kissane*	Clearwater Dam - foundation drilling and grouting for repair of sinkholes *Mark Harris*	Break in Exhibit Hall	Update on the investigation of the effects of boring sample size (3' vs 5") on measured cohesion in soft clays *Richard Pinner*	Soil-bentonite cutoff wall through free-product at Indiana Harbor CDF *Joseph Schulenberg*	Soil-bentonite cutoff wall through dense alluvium with boulders into bedrock, McCook Reservoir *William Rochford*
Room 228	TRACK 7 Session 7C / 7D	Engineering geology during design and construction of the Marmet lock project *Michael Nield*	Mill Creek deep tunnel - Geological affects on proposed structures and construction techniques *Tres Henn*	Earth pressure loads behind the new McAlpine Lock replacement project *Troy O'Neal*	Break in Exhibit Hall	Geosynthetics and construction of the Bonneville lock and dam second powerhouse corner collector surface flow bypass project *Art Fong*	McAlpine lock replacement - foundation characteristics and excavation *Kenneth Henn*	
Room 229	TRACK 8 Session 8C / 8D	What to do if your dam is expanding: a case study *Greg Yankey*	Unpaved road stabilization with chlorides *Michael Mitchell*	Use of ultra-fine amorphous colloidal silica to produce a high-density, high-strength rock-matching grout for instrumentation grouting *Brian Green*	Break in Exhibit Hall	Innovative techniques in the Gabion system *George Ragazzo*	Addressing cold regions issues in pavement engineering *Lynette Barna*	Geology of New York Harbor - geological and geophysical methods of characterizing the stratigraphy for dredging contracts *Ben Baker*

Wednesday, August 3, 2005 Concurrent Sessions

Structural Engineering Track

Room	Track	8:00 AM	8:30 AM	9:00 AM	9:30 AM	Track	10:30 AM	11:00 AM	11:30 AM
Room 240	**TRACK 12** Civil Works Structural — Session 12A	Recent changes to Corps guidance on steel hydraulic structures *Joe Padula*	Crack repairs and instru-mentation of Greenup L&D miter gate *Doug Kish*	Recent hydraulic steel structures findings in the Portland district *Travis Adams*	Break in Exhibit Hall	**TRACK 12** Civil Works Structural — Session 12B	Perry Lake gate repair *Marvin Parks*	Mel Price auxiliary lock gate repair *Andrew Schimpf*	Mel Price auxiliary lock gate repair (Continued) *Andrew Schimpf*
Room 241	**TRACK 13** Civil Works Structural — Session 13A	Folsom Dam evaluation of stilling basin performance for uplift loading for historic flows *Rick Poeppelman*	Rehabilitation of Folsom Dam stilling basin *Rick Poeppelman*	Seismic stability evaluation of Folson Dam *Enrique Matheu*	Break in Exhibit Hall	**TRACK 13** Civil Works Structural — Session 13B	Seismic stress analysis of Folsom Dam *Enrique Matheu*	Barge impact guidance for rigid lock walls, ETL 110-2-563 and probalistic barge impact analysis *John Clarkson*	Belleville barge accident *John Clarkson*
Room 242	**TRACK 14** Bridges/ Buildings — Session 14A	The USACE bridge management system *Phil Sauser*	Standard procedures for fatigue evaluation of bridges *Phil Sauser*	Fatigue and fracture assessment of Jesse Stuart Highway Bridge *John Jaeger*	Break in Exhibit Hall	**TRACK 14** Bridges/ Buildings — Session 14B	Building an in-house bridge inspection program *Jennifer Laning*	Fatigue analysis of Summit bridge *Jim Chu*	Consolidation of Structural criteria for military construction *Steve Sweeney*

12 Noon — **Lunch in Exhibit Hall**

Room	Track	1:30 PM	2:00 PM	2:30 PM	3:00 PM	Track	4:00 PM	4:30 PM	5:00 PM
Room 240	**TRACK 12** Civil Works Structural — Session 12C	Overview of John T. Myers locks improvements project *Greg Werncke*	John T. Myers rehabilitation study *Greg Werncke*	Ohio River Greenup Lock extension *Rodney Cremeans*	Break in Exhibit Hall	**TRACK 12** Civil Works Structural — Session 12D	McAlpine lock replace-ment project, project summary and status of construction *Kathleen Feger*	Results of Roller Com-pacted concrete place-ment at the McAlpine lock replacement project *Larry Dalton*	Tennessee Valley authority Kentucky lock addition down-stream middle wall monoliths *Scott Wheeler*
Room 241	**TRACK 13** Civil Works Structural — Session 13C	Portugues Dam, Ponce, Puerto Rico project update *Jim Mangold*	Portugues Dam, Ponce, Puerto Rico, RCC design and testing program *Jim Hinds*	Portugues Dam, Ponce, Puerto Rico, Thermal analysis of hydra-tion and subsequent cooling of RCC *Ahmed Nisar*	Break in Exhibit Hall	**TRACK 13** Civil Works Structural — Session 13D	Miter gate anchorage design *Andy Harkness*	Obermeyer gated spill-way project - S381 *Michael Rannie*	McCook Reservoir design of high pressure steel gates *Luelseged Tekola*
Room 242	**TRACK 14** Brigdes/ Buildings — Session 14C	Unified facilities criteria seismic design for buildings *Jack Hayes*	Seismic requirements for architectural, mechanical and electrical components *John Connor*	Quality assurance for seismic resisting systems *John Connor*	Break in Exhibit Hall	**TRACK 14** Bridges/ Buildings — Session 14D	Unified facilities criteria masonry structural design for buildings *Tom Wright*	Cathodic protection of building reinforcing steel (in Diego Garcia) *Thomas Tehada*	USACE Homeland security web portal *Mike Pace*

Wednesday, August 3, 2005 Concurrent Sessions

Dam Safety Track & Construction Track

Room	Track / Session	8:00 AM	8:30 AM	9:00 AM	9:30 AM	Track / Session	10:30 AM	11:00 AM	11:30 AM
Room 224	TRACK 10 Dam Safety, Session 10A	Tuttle Creek warning and alert systems *Bill Empson*	Lessons from the dam failure warning system exercise - Tuttle Creek *Bill Empson*	Tuttle Creek ground modification treatability program *Bill Empson*	Break in Exhibit Hall	TRACK 10 Dam Safety, Session 10B	Dam safety analysis of Cannelton Dam *Terry Sullivan*	John Martin Dam, CO - Dam safety structural upgrades *George Diewald*	Vesuvius Lake Dam rehabilitation *Susan Peterson*
Room 225	TRACK 11 Dam Safety, Session 11A	Canton lake spillway stabilization project: IS a test anchor program NECESSARY? *Randy Mead*	Dynamic testing and numerical correlation studies for Folsom dam *Ziyad Duron*	Status of portfolio risk assessment *Eric Halpin*	Break in Exhibit Hall	TRACK 11 Dam Safety, Session 11B	Mississinewa Dam remediation *Jeff Schaefer*	Wolf creek seepage history *Michael Zoccola*	Blue dam major rehabilitation *Michael McCray*
Room 230	TRACK 19 Construction, Session 19A	RMS Update *Haskell Barker*	RMS Update (Continued) *Haskell Barker*	Updated CQM for Contractors Course *Walt Norko*	Break in Exhibit Hall	TRACK 19 Construction, Session 19B	Lessons learned on major construction projects *Jim Cox*	Update on safety issues - Safety manual 385-1-1 *Charles Ray Waits*	Update on safety issues - safety manual 385-1-1 (continued) *Charles Ray Waits*
Room 231	TRACK 20 Construction, Session 20A	Construction methods in Russia *Lance Lawton*	Construction methods in Russia (Continued) *Lance Lawton*	Renovating the Pentagon using Design/Build delivery *Brian Dziekonski*	Break in Exhibit Hall	TRACK 20 Construction, Session 20B	Completion of the Olmsted approach walls *Dale Miller*	Completion of the Olmsted approach walls (Continued) *Dale Miller*	Construction management at risk *Christopher Prinslow*

12 Noon — **Lunch in Exhibit Hall**

Room	Track / Session	1:30 PM	2:00 PM	2:30 PM	3:00 PM	Track / Session	4:00 PM	4:30 PM	5:00 PM
Room 224	TRACK 10 Dam Safety, Session 10C	Project specific risk analysis - Success Dam *Ronn Ross*	Dam safety lessons learned, Winter storm 2005, Muskingum & Scioto Basins *Charles Barry*	Dam security and Dams Government Coordinating Council *Roy Braden*	Break in Exhibit Hall	TRACK 10 Dam Safety, Session 10D	Prompton Dam hydrologic deficiency and spillway modification *Troy Cosgrove*	"Well, that's water over the dam" - Rough River spillway adequacy design *Richard Pruitt*	Roller-compacted concrete for dam spillways and overtopping protection *Fares Abdo*
Room 225	TRACK 11 Dam Safety, Session 11C	Clearwater Dam major rehabilitation *Bobby Van Cleave*	Success dam seismic dam safety modification *Norbert Suter*	Problems on the Santa Ana River - Prado Dam *Douglas Chitwood*	Break in Exhibit Hall	TRACK 11 Dam Safety, Session 11D	Problems on the Santa Ana River - Seven Oaks Dam *Robert Kwan*	Dam safety program management tools *Tommy Schmidt*	
Room 230	TRACK 19 Construction, Session 19C	3D Modeling and impact on constructability *Gary Cough*	3D Modeling and impact on constructability (Continued) *Gary Cough*	Construction in Iraq & Afganistan *Walt Norko*	Break in Exhibit Hall	TRACK 19 Construction, Session 19D	Air Force streamlining Design/Build *Joel Hoffman*	Air Force streamlining Design/Build (Continued) *Joel Hoffman*	Sustainable design requirements & construction implementation *Harry Goradia*
Room 231	TRACK 20 Construction, Session 20C	Tsunami reconstruction *Andy Constantaras*	Tsunami reconstruction (Continued) *Andy Constantaras*	Military construction transformation in support of Army transformation *Sally Parsons*	Break in Exhibit Hall	TRACK 20 Construction, Session 20D	MEDCOM Construction Issues *Rick Bond*	MEDCOM Construction Issues (Continued) *Rick Bond*	*TBA*

Wednesday, August 3, 2005 Concurrent Sessions

Electrical & Mechanical Engineering Track

Room	Track / Session	8:00 AM	8:30 AM	9:00 AM	9:30 AM	Track / Session	10:30 AM	11:00 AM	11:30 AM
Room A	TRACK 15 Military Electrical, Session 15A	Tri-Service Electrical Criteria Overview - *Tri-Service Panel*	Tri-Service Electrical Criteria Overview - (Continued) *Tri-Service Panel*	Tri-Service Electrical Criteria Overview -(Continued) *Tri-Service Panel*	Break in Exhibit Hall	TRACK 15 Military Electrical, Session 15B	Interior/Exterior and security lighting criteria *Tri-Service Panel*	Information technology systems criteria *Tri-Service Panel*	Information technology systems criteria (Continued) *Tri-Service Panel*
Room B	TRACK 16 Military Mechanical, Session 16A	Building Commissioning *Dale Herron*	HVAC Commissioning *Dale Herron*	Ventilation and indoor air quality *Davor Novosel*	Break in Exhibit Hall	TRACK 16 Military Mechanical, Session 16B	Ventilation and indoor air quality (Continued) *Davor Novosel*	Refrigerant implications for HVAC specifications, selection, and o&m - now and future *Mike Thompson*	Refrigerant implications for HVAC specifications, selection, and o&m - now and future (Continued) *Mike Thompson*
Room D	TRACK 17 Military Mechanical / Electrical, Session 17A	Sustainable design update *Harry Goradia*			Break in Exhibit Hall	TRACK 17 Military Mechanical / Electrical, Session 17B	Utility systems security and fort future *Vicki L. Van Blaricum*	Acoustic leak detection for utilities distribution systems *Sean Morefield*	Acoustic leak detection for utilities distribution systems (Continued) *Sean Morefield*
Room E	TRACK 18 Civil Mechanical, Session 18A	Emsworth Dam vertical lift gate hoist replacement *John Nites*	Hydraulic drive for Braddock Dam *Janine Krempa*	John Day navigation lock upstream lift gate wire rope failure *Ronald Wridge*	Break in Exhibit Hall	TRACK 18 Civil Mechanical, Session 18B	Overhead bulkhead at Olmstead Lock *Rick Schultz*	Replacement of gate # 5 intermediate gear and pinion at RC Byrd Lock and Dam *Brenden McKinley*	Mechanical design issues during construction of McAlpine Lock *Richard Nichols*

12 Noon **Lunch in Exhibit Hall**

Room	Track / Session	2:00 PM	2:30 PM	3:00 PM	3:30 PM	Track / Session	4:00 PM	4:30 PM	5:00 PM
Room A	TRACK 15 Military Electrical, Session 15C	Mass notification system *Tri-Service Panel*	Mass notification system (Continued) *Tri-Service Panel*	Electronic card access locks *Fred Crum*	Break in Exhibit Hall	TRACK 15 Military Electrical, Session 15D	Lightning protection standards *Richard Bouchard*	Lightning and surge protection *Tri-Service Panel*	Lightning and surge protection (Continued) *Tri-Service Panel*
Room B	TRACK 16 Military Mechanical, Session 16C	Basic design considerations for geothermal heat pump systems *Gary Phetteplace*	Basic design considerations for geothermal heat pump systems (Continued) *Gary Phetteplace*	Pentagon renovation *Mitch Duke*	Break in Exhibit Hall	TRACK 16 Military Electrical, Session 16D	Effective use of evaporative cooling for industrial and institutional/office facilities *Leon Shapiro*	Efective use of evaporative cooling for industrial and institutional/office facilities (Continued) *Leon Shapiro*	Non-hazardous chemical treatments for heating and cooling systems *Vincent Hock*
Room D	TRACK 17 Civil Mechanical / Electrical, Session 17C	Hydropower asset management partnership (hydroAMP) *Lori Rux*	New gas fueled/diesel fueled turbine powered electrical generating station in Iraq *Lester Lowe*	The construction of distribution tunnels and pump installation for the metropolitan Chicago sewer systems *Ernesto Go*	Break in Exhibit Hall	TRACK 17 Civil Mechanical / Electrical, Session 17D	The Festus/Crystal City levee and pump station project *Stephen Farkas*	Remote operations for Kaskaskia Dam *Shane Nieukirk*	Technological advances in lock control systems *Andy Schimpf*
Room E	TRACK 18 Civil Mechanical, Session 18C	New coating products for civil works structures *Al Beitelman*	New guide specification for procurement of turbine oils *John Micetic*	Synchronous condensing with large Kaplan turbine - A case study *Brian Moentenich*	Break in Exhibit Hall	TRACK 18 Civil Mechanical, Session 18D	Acquifer storage and recovery (ASR) system *Gerald Deloach*	Wastewater infrastructure improvements in Appalachia *James Sadler*	Storm water pumps *Thomas Jamieson*

Thursday, August 4, 2005 Concurrent Sessions

HH&C Track

Room	Track	8:00 AM	8:30 AM	9:00 AM	9:30 AM	Track	10:30 AM	11:00 AM	11:30 AM
Room 220	**TRACK 1 Sedimentation & New Concepts Session 1E**	Ice jams, contaminated sediment and structures Clark Fork River, MT *Andrew Tuthill*	Increased bed erosion due to ice *John Hains*	Monitoring the Mississippi River using GPS coordinated video *James Gutshall*	**Break in Exhibit Hall**	**TRACK 1 Sedimentation, Case Examples Session 1F**	Watershed approach to stream stability the reduction of nutrients *John B. Smith*	Monitoring the effects of sedimentation from Mount St. Helen *Alan Donner*	Navigation and environmental interests in alleviating repetitive dredging *Jason Brown*
Room 221	**TRACK 2 Water Management Session 2E**	Enhancements and new capabilities of HEC-ResSim 3.0 *Fauwaz Hanbali*	Transition to Oracle based data system *Joel Asunskis*	Accessing real time Mississippi Valley water level data *Rich Engstrom*		**TRACK 2 Water Management Session 2F**	Hurricane Season 2004 *Susan Sylvester*	Reevaluation of a project's flood control benefits *Ferris Chamberlin*	Helmand Valley water management plan *Jason Needham*
Room 222	**TRACK 3 Case Studies Session 2E**	Red River of the north flood protection project *Michael Lesher*	Southeast Arkansas flood control & water supply feasibility study *Thomas Brown*	McCook and Thorton tunnel and reservoir modeling *David Kiel*		**TRACK 3 Case Studies Session 3F**	Ala Wai Canal Project, Honolulu, Oahu, Hawaii *Lynnette Schapers*	Missouri River geospatial decision support framework *Brian Baker*	Systemic analysis of the Mississippi & Illinois Rivers *Dennis Stephens*
Room 223	**TRACK 4 Modeling Session 4E**	Hydrologic models supported by ERDC *Robert Wallace*	HEC-HMS Version 3.0 new features *Jeff Harris*	SEEP2D & GMS: Simple tools for solving a variety of seepage problems *Clarissa Hansen*		**TRACK 4 Modeling Session 4F**	Water quality and sediment transport in HEC-RAS *Mark Jensen*	Advances to the GSSHA program *Aaron Byrd*	Software integration for watershed studies HEC-WAT *Chris Dunn*

12 Noon **Lunch**

Room	Track	1:30 PM	2:00 PM	2:30 PM	3:00 PM	Track	3:30 PM	4:00 PM	4:30 PM
Room 220	**TRACK 1 Water Quality Management Session 1G**	San Francisco Bay Mercury TMDL-Implications for constructed wetlands *Herb Fredrickson*	Abandoned mine land: Eastern and Western perspectives *Kate White*	A lake tap for temperature control tower construction at Cougar Dam *Steve Schlenker*	**Break**	**TRACK 1 Watershed Management Session 1H**	Demonstrating innovative river restoration technologies: Truckee River, NV *Chris Dunn*	Comprehensive watershed restoration in the Buffalo district *Anthony Friona*	Translating the hydrologic tower of Babel *Dan Crawford*
Room 221	**TRACK 2 Water Management Session 2G**	Developing reservoir operation plans to manage erosion *Patrick O'Brien*	New approaches to water management decision making *James Barton*	Improved water supply forecasts for Kooteny basin using principal components regression *Randal Wortman*		**TRACK 2 Water Management Session 2H**	Prescriptive reservoir modeling and ROPE study *Jason Needham*	Missouri River mainstem operations *Larry Murphy*	Res-Sim model for the Columbia River *Arun Mylvahanan*
Room 222	**TRACK 3 Section 227 Session 3G**	Section 227 Workshop/ Program Review *William Curtis*	Section 227 Workshop/ Program Review (Continued) *William Curtis*	Section 227 Workshop/ Program Review (Continued) *William Curtis*		**TRACK 3 Section 227 Session 3H**	Section 227 Workshop/ Program Review *William Curtis*	Section 227 Workshop/ Program Review (Continued) *William Curtis*	Section 227 Workshop/ Program Review (Continued) *William Curtis*
Room 223	**TRACK 4 Modeling Session 4G**	Little Calumet River unsteady flow model conversion *Rick Ackerson*	Kansas City River basin model *Edward Parker*	Design guidance for breakup ice control *Andrew Tuthill*		**TRACK 4 Modeling Session 4H**	Forebay flow simulations using Navier-Stokes code *Charlie Berger*	Use of regularizatino as a method for watershed model calibration *Brian Skahill*	Demonstration program in the arid southwest *Margaret Jonas*

Thursday, August 4, 2005 Concurrent Sessions

Geotechnical Track

Room	Track	8:00 AM	8:30 AM	9:00 AM	9:30 AM	Track	10:30 AM	11:00 AM	11:30 AM
Room 226	TRACK 5 Session 5E	Dynamic deformation analyses Dewey Dam Huntintong District Corps of Engineers *Greg Yankey*	Seismic stability evaluation for Ute Dam, NM *John France*	An overview of criteria used by various organizations for assessments and seismic remediation of earth dams *Sean Carter*	Break in Exhibit Hall	TRACK 5 Session 5F	USACE seepage berm design criteria and district practices *George Sills*	Ground penetrating radar applications for the assessment of airfield pavements *Lulu Edwards*	Challenges of the Fernando Belaunde Terry road upgrade Campanillia to Pizana - Peru road project *Michael Wielputz*
Room 227	TRACK 6 Session 6E	Small geotechnical project, big stability problem - The Block Church Road experience *Jonathan Kolber*	Geophysical investigation of foundation conditions beneath Folsom Dam *Jose Llopis*	Bioengineering slope stabilization techniques coupled with traditional engineering applications - The result a stable slope *Bethany Bearmore*		TRACK 6 Session 6F	Shoreline armor stone quality issues *Joseph Kissane*	Mill Creek - An urban flood control challenge *Monica Greenwell*	Next stop, The Twilight Zone *Troy O'Neal*
Room 228	TRACK 7 Session 7E	The geotechnical and structural issues impacting the Dalles spillway construction *Kristie Hartfeil*	The Dalles spillway engineering and design *Kristie Hartfeil*	The future of the discrete element method in infrastructure analysis *Raju Kala*		TRACK 7 Session 7F	Evaluating the portable falling weight deflectometer as a low-cost technique for posting seasonal load restrictions on low volume payments *Maureen Kestler*	Soil structure interaction effects in the seismic evaluation of success dam control tower *Michael Sharp*	Olmsted locks and Dam project geotechnical/construction issues *Jeff Schaefer*
Room 229	TRACK 8 Session 8E	Rubblization of airfield concrete pavement *Eileen Velez-Vega*	US Army airfield pavement assessment program *Haley Parsons*	Critical state for probabilistic analysis of levee underseepage *Douglas Crum*		TRACK 8 Session 8F	Curing practices for modern concrete construction *Toy Poole*	AAR at Carters Dam, a different approach *James Sanders*	Concrete damage at Carters Dam, GA *Toy Poole*

12 Noon **Lunch**

Room	Track	1:30 PM	2:00 PM	2:30 PM	3:00 PM	Track	3:30 PM	4:00 PM	4:30 PM
Room 226	TRACK 5 Session 5G	Slope stability evaluation of the Baldhill Dam right abutment *Neil Schwanz*	Lateral pile load test results within a soft cohesive foundation *Richard Varuso*	Design and construction of anchored bulheads for river diversion, Seabrook, NH *Siamac Vaghar*	Break	TRACK 5 Session 5H	Characterization of soft marine clays - A case study at Craney Island *Aaron Zdinak*	50 years of NRSC experience with engineering problems caused by dispersive clays *Danny McCook*	Changes in the post-tensioning institutes new (4th Ed. 2004) "Recommendations for prestressed rock and soil anchors" *Michael McCray*
Room 227	TRACK 6 Session 6G	Perils in back analysis failures *Greg Yankey*	Reconstruction of deteriorated lock walls concrete after blasting and other demolition removal techniques *Steve O'Connor*	Flood fighting structures demonstrations and evaluation program *George Sills*		TRACK 6 Session 6H	Innovative design concepts incorporated into a landfill closure and reuse design *Dave Ray*	Laboratory testing of flood fighting structures *Johannes Wibowo*	Bluff stabilization along Lake Michigan using active and passive dewatering techniques *Eileen Glynn*
Room 228	TRACK 7 Session 7G	Geotechnical instrumentation and foundation re-evaluation of John Day lock and Dam, Columbia River, Oregon-Washington *David Scofield*	A study of the long term performance of seepage cutoff barriers in dams *John Rice*	Design, construction, and performance of seepage barriers for Guanella Dam, near Empire, CO *John France*		TRACK 7 Session 7H	Sensitive infrastructure sites and structures - Sonic drilling offers quality control and non-destructive advantages to geotechnical construction drilling *John Davis*	Subgrade failure criteria according to soil type and moisture condition *Edel Cortez*	The automated stability monitoring of the Mississippi River levees using the range scan system *Robert Jolissian*
Room 229	TRACK 8 Session 8G	Damaging interactions among concrete materials *Toy Poole*	Economic effects on construction of uncertainty in test methods *Toy Poole*	Major issues in materials specifications *Toy Poole*		TRACK 8 Session 8H	Spall and intermediate-sized repairs for PCC pavements *Reed Freeman*	Acceptance criteria for unbonded aggregate road surfacing materials *Reed Freeman*	Effective partnering to overcome an interruption in the supply of Portland cement during construction of Marmet lock and Dam *Billy Neeley*

Thursday, August 4, 2005 Concurrent Sessions

Geotechnical, Specifications, Electrical & Mechanical Engineering & Construction Tracks

Room	Track	8:00 AM	8:30 AM	9:00 AM	9:30 AM	Track	10:30 AM	11:00 AM	11:30 AM
Room 225	**TRACK 9** Geotechnical **Session 9E**	Seepage Committee Meeting *GROUP DISCUSSION*	Seepage Committee Meeting (Continued) *GROUP DISCUSSION*	Seepage Committee Meeting (Continued) *GROUP DISCUSSION*	Break in Exhibit Hall	**TRACK 9** Geotechnical **Session 9F**	GMCoP Forum *GROUP DISCUSSION*	GMCoP Forum (Continued) *GROUP DISCUSSION*	GMCoP Forum (Continued) *GROUP DISCUSSION*
Room 232	**TRACK 21** Specifications **Session 21E**	SpecsIntact-Demonstration of the SI explorer, publishing to PDF and Word *Patricia Robinson*	SpecsIntact - Demonstration of the SI editor, UMRL and reference wizard *Patricia Robinson*	UFGS status and direction *Jim Quinn*		**TRACK 21** Specifica-tions **Session 21F**	UFGS transitin to Master-Format 2004 *Carl Kersten*	Project specifications for the upper tier Folsom outlet works modifications *Steve Freitas*	UFGS dredging *Don Carmen*
Room A	**TRACK 15** Military Electrical **Session 15E**	Electronic Security *Tri-Service Panel*	Electronic Security (Continued) *Tri-Service Panel*	AIRFIELD lightning protection & grounding and lighting *Tri-Service Panel*		**TRACK 15** Military Electrical **Session 15F**	Electrical safety and arc flash UFC *Tri-Service Panel*	Electrical safety and arc flash UFC (Continued) *Tri-Service Panel*	Electrical infrastructure in Iraq - Restore Iraqi electricity *Joseph Swiniarski*
Room B	**TRACK 16** Military Mechanical **Session 16E**	Lon works technology update *David Schwenk*	BACnet Technology Update *David Schwenk*	Implementation of Lon-based specifications *Will White*		**TRACK 16** Military Mechanical **Session 16F**	Prefabricated Chiller Plants *Trey Austin*	Seismic for ME systems *Greg Stutts*	Design considerations for the prevention of mold *Quinn Hart*
Room D	**TRACK 17** Civil Mechanical **Session 17E**	Lessons learned on flood water pump stations *Mark Robertson*	Armada of pump stations, Grand Forks and East Grand Forks *Timothy Paulus*	Various screen equipment selection guide *Sara Benier*		**TRACK 17** Civil Mechanical **Session 17F**	Lock gate replacement system *Will Smith*	Lock gate replacement system (Continued) *Will Smith*	Automated closure gate design for Duck creek flood control *Mark Robertson*
Room 230	**TRACK 19** Construction **Session 19E**	NAVFAC Construction scheduling *Glenn Saito*	NAVFAC Construction scheduling (Continued) *Glenn Saito*	ACASS/CASS - CPARS *Ed Marceau*		**TRACK 19** Construction **Session 19F**	Self-consolidating concrete *Beatrix Kerhoff*	Self-consolidating concrete (Continued) *Beatrix Kerhoff*	
Room 231	**TRACK 20** Construction **Session 20E**	Update on DAWIA and Facilities Engineering *Mark Grammer*	Update on DAWIA and Facilities Engineering (Continued) *Mark Grammer*	Partnering as a best practice *Ray DuPont*		**TRACK 20** Construction **Session 20F**	S&A Update *Harry Jones*	Construction Issues Open Forum (Q&A) *Don Basham*	Construction Issues Open Forum (Q&A) (Continued) *Don Basham*

12 Noon — **Lunch**

Room	Track	1:30 PM	2:00 PM	2:30 PM	3:00 PM	3:30 PM	4:00 PM	4:30 PM
Room 225	**TRACK 9** Geotechnical **Session 9G**	Seismic Manual *GROUP DISCUSSION*	Seismic Manual (Continued) *GROUP DISCUSSION*	Seismic Manual (Continued) *GROUP DISCUSSION*				

Thursday, August 4, 2005 Concurrent Sessions

Dam Safety Track & Structural Engineering Track

Room	Track	8:00 AM	8:30 AM	9:00 AM	9:30 AM
Room 224	**TRACK 10** Dam Safety Session 10E	Seepage and stability, final evaluation for reservoir pool raising project, Terminus Dam, Kaweah River, CA *Michael Ramsbotham*	Initial filling plan, Terminus dam spillway enlargement, Terminus Dam, Kaweah River, CA *Michael Ramsbotham*	Hydrologic aspects of operating in a "failure mode" - Fern Ridge Lake, OR *Bruce Duffe*	Break in Exhibit Hall
Room 240	**TRACK 12** Civil Works Structural Session 12E	London lock and dam, West Virginia major rehabilitation project *David Sullivan*	Replacing existing lock 4-Innovative designs for Charleroi lock *Steveb Stoltz*	Use of non-linear incremental structural analysis in the design of the Charleroi lock *Randy James*	Break in Exhibit Hall
Room 241	**TRACK 13** Civil Works Structural Session 13E	Chicago shoreline project *Jan Plachta*	Structural assessment of Bluestone Dam *Robert Reed*	Duck Creek, OH local flood protection projection phase III Culvert damage *Jeremy Nichols*	Break in Exhibit Hall
Room 242	**TRACK 14** Bridges/ Buildings Session 14E	Urban search & rescue program overview *Tom Niedernhofer*	Evaluation and repair of blast damaged reinforced concrete beams *John Hudson*	Single degree of freedom blast effects spreadsheets *Dale Nebuda*	Break in Exhibit Hall

Room	Track	10:30 AM	11:00 AM	11:30 AM
Room 224	**TRACK 10** Dam Safety Session 10F	A dam safety study involving cascading dam failures *Gordon Lance*		The relationship of seismic velocity to the erodibility index *Joseph Topi*
Room 240	**TRACK 12** Civil Works Structural Session 12F	Olmsted dam in-the-wet construction methods *Lynn Raque*	Completion of the Olmstead approach walls *Terry Sullivan*	John Day lock monolith repair *Mathew Hanson*
Room 241	**TRACK 13** Civil Works Structural Session 13F	Development of design criteria for the Rio Puerto Nuevo contract 2D/2E channel wall *Jana Tanner*	Design of concrete lined tunnels in rock *David Force*	Indianapolis north phase IIIA project *Gene Hoard*
Room 242	**TRACK 14** Bridges/ Buildings Session 14F	UFC 4-023-02 Structural design to resist explosive effects for existing buildings *Jim Caulder*	Progressive collapse UFC requirements *Brian Crowder*	U.S. general services admnistrative progressive collapse design guidelines applied to concrete moment-resisting frame buildings *David Billow*

12 Noon — **Lunch**

Room	Track	1:30 PM	2:00 PM	2:30 PM	3:00 PM
Room 224	**TRACK 10** Dam Safety Session 10G	Dam safety instrumentation data management utilizing WinIDP to aid data collection and evaluation *Travis Tutka*	Automated instrumentation assessments at Marmet lock & Dam *Ronald Rakes*	Potential failure mode analysis of Eau Galle Dam *David Rydeen*	Break
Room 240	**TRACK 12** Civil Works Structural Session 12G	Inner Harbor navigation canal and lock structure *Mark Gonski*	Design features and challenges of the Comite River diversion project *Christopher Dunn*	Waterline support failure on the Harvey canal: A case study *Angela DeSoto Duncan*	Break

Room	Track	3:30 PM	4:00 PM	4:30 PM
Room 224	**TRACK 10** Dam Safety Session 10H	Dam safety officers panel - The Good *Bruce Murray*	Dam safety officers panel - The Bad *Bruce Murray*	Dam safety officers panel - The Ugly *Bruce Murray*
Room 240	**TRACK 12** Civil Works Structural Session 12H	Public appeal of major civil projects- The good, the bad and the ugly *Kevin Holden*	Des Moines Riverwalk *Thomas Heinold*	Chickamauga lock and Dam height optimization study using Monte Carlo simulation *Leon Schieber*

Thursday, August 4, 2005 Concurrent Workshops

Room	Workshop	1:30 PM	2:00 PM	2:30 PM	3:00 PM	Workshop	3:30 PM	4:00 PM	4:30 PM
Room 241	**Workshop 1** DoD Security Engineering **Session 1A**	Security planning & minimum standards *Curt Betts*	Security planning & minimum standards (Continued) *Curt Betts*	Security planning & minimum standards (Continued) *Curt Betts*	Break	**Workshop 1** DoD Security Engineering **Session 1B**	Security design manuals *Bernie Deneke*	Security design manuals (Continued) *Bernie Deneke*	Security design manuals (Continued) *Bernie Deneke*
Room 231	**Workshop 2** Electrical Workshop **Session 2A**	National Electrical Code 2005 Changes *Mark McNamara*	National Electrical Code 2005 Changes (Continued) *Mark McNamara*	National Electrical Code 2005 Changes (Continued) *Mark McNamara*	Break	**Workshop 2** Electrical Workshop **Session 2B**	National Electrical Code 2005 Changes (Continued) *Mark McNamara*	National Electrical Code 2005 Changes (Continued) *Mark McNamara*	National Electrical Code 2005 Changes (Continued) *Mark McNamara*
Room 242	**Workshop 3** Mechanical Engineering **Session 3A**	Design and application of packaged central cooling plants *The Trane Company*	Design and application of packaged central cooling plants (Continued) *The Trane Company*	Design and application of packaged central cooling plants (Continued) *The Trane Company*	Break	**Workshop 3** Mechanical Engineering **Session 3B**	Improving dehumidification in HVAC systems *The Trane Company*	Improving dehumidification in HVAC systems (Continued) *The Trane Company*	Improving dehumidification in HVAC systems (Continued) *The Trane Company*
Room 230	**Workshop 4** Construction **Session 4A**	Construction Community of Practice Forum *Walt Norko*	Construction Community of Practice Forum (Continued) *Walt Norko*	Construction Community of Practice Forum (Continued) *Walt Norko*	Break				
Room 232	**Workshop 5** Specifications **Session 5A**	Open Meeting of Corps Specifications Steering Committee *Robert Iseli, et al.*	Open Meeting of Corps Specifications Steering Committee (Continued) *Robert Iseli, et al.*	Open Meeting of Corps Specifications Steering Committee (Continued) *Robert Iseli, et al.*	Break	**Workshop 5** Specifications **Session 5B**	Open Meeting of Corps Specifications Steering Committee (Continued) *Robert Iseli, et al.*	Open Meeting of Corps Specifications Steering Committee (Continued) *Robert Iseli, et al.*	Open Meeting of Corps Specifications Steering Committee (Continued) *Robert Iseli, et al.*

NOTES

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

2005 Tri-Service Infrastructure Systems Conference & Exhibition
"Re-Energizing Engineering Excellence"
August 2-4, 2005
St. Louis, MO

Engineering Analysis of Airfield Lighting System Lightning Protection

University of Florida

PI: Dr. Vladimir A. Rakov, Co-PI: Dr. Martin A. Uman

50% Submittal Report (July 1, 2005)

Following is a my interpretation of the report.

- No consensus on proper method
- Should the counterpoise be bonded to light fixtures?
- Should circuits have an insulated safety ground?
- Should the counterpoise and safety ground be bonded to each other?

- Provide engineering analysis, modeling, simulation, and other analyses as required…

- Scenarios to be studied:
  - A: Separate Grounding Conductor
  - B: Interconnected Counterpoise and Separate Grounding Conductor
  - C: Interconnected Counterpoise without Separate Grounding Conductor
  - D: Individual Ground Rods without Separate Grounding Conductor

Various Grounding Requirements.

FAA AC No.: 150/5340-30, dated 4/30/04

12.6 SAFETY (EQUIPMENT) GROUND.

A safety ground must be installed at each light fixture. The purpose of the safety ground is to protect personnel from possible contact with an energized light base or mounting stake as the result of a shorted cable or isolation transformer. The safety ground may be a #6 AWG bare jumper connected to the ground lug at the fixture base or stake to a 5/8" by 8 foot minimum ground rod installed beside the fixture. A safety ground circuit may also be installed and connected to the ground bus at the airfield lighting vault. The safety ground circuit may be a #6 AWG insulated wire for 600 volts (XHHW). Insulation should be colored green. Attach the safety ground circuit to the ground lug at each light base or mounting stake, and secure the entire lighting circuit to the ground bus at the vault. The safety ground circuit must be installed in the same duct or conduit as the lighting power conductors.

Later in appendix 5, it states bare wire in all conduits.

Various Counterpoise Requirements.

UFC 3-535-01

12.1.5. EQUIPMENT GROUNDING SYSTEM.

Install #6 copper AWG green-jacketed wires identified as an equipment ground, in ducts with primary circuit and connect all light bases. Note, if used for approach lights without a light base, connect ground to each light fixture and to the vault lighting system.

12.1.5.1. GROUND CRITERIA.

The ground wire serves as a safety ground, protecting against high voltages that could be brought to the light base. As an alternative, each aviation light base will be grounded with a ground rod. System safety ground wires are to be bonded only at the vault, manholes and handholes, light bases and cans. See the following paragraphs for providing a counterpoise system for lightning protection.

NAVAIR 51-50AAA-2

15. GROUNDING.

Each light fixture and metal case or frame of equipment shall be grounded. Grounding is primarily for safety in case of cable faults. The grounding may be provided by driven ground rods or connection to a grounding cable. Preferably the equipment grounds should not be connected to the counterpoise to avoid equipment damage from lightning strikes being conducted by the counterpoise through the equipment.

Various Counterpoise Requirements.

FAA AC No.: 150/5340-30, dated 4/30/04

12.5 COUNTERPOISE (LIGHTNING PROTECTION). The counterpoise system is installed on airfields to provide some degree of protection from lightning strikes to underground power and control cables. The counterpoise conductor is a bare solid copper wire, #6 AWG. The conductor is connected to ground rods spaced a maximum of 500 feet apart. Connection to the ground rod is made using exothermic welds. Where cable and/or conduit runs are adjacent to pavement, such as along runway or taxiway edges, the counterpoise is installed 8" below grade, located half the distance from edge of pavement to the cable and/or conduit runs. The counterpoise is not connected to the light fixture base can or mounting stake. Where cable and/or conduit runs are not adjacent to pavements, the counterpoise is installed 4" minimum above the cable and/or conduit. The height above the cable and/or conduit is calculated to ensure the cables and/or conduits to be protected are within a 45° zone of protection below the counterpoise. The counterpoise will be terminated at ground rods located on each side of a duct crossing. Where conduit or duct runs continue beneath pavement (i.e., apron areas, etc.), install the counterpoise a minimum of 4 inches above conduits or ducts along the entire run. Counterpoise connections are made to the exterior ground lug on fixture bases of runway touchdown zone lights, runway centerline lights, and taxiway centerline lights installed in rigid pavement. The counterpoise is bonded to the rebar cage around the fixture base. Where installed in materials that accelerate the corrosion of the proper conductor, the counterpoise must be type TW insulated. Coat any exposed copper/brass at connections to the base can with a 6 mil layer of 3M ScotchKote electrical coating or approved equivalent. Ensure all counterpoise connections are UL listed for direct earth burial and/or installation in concrete as applicable. Refer to Figure 108 for counterpoise installation details.

Various Counterpoise Requirements.

UFC 3-535-01

12.1.6. COUNTERPOISE LIGHTNING PROTECTION SYSTEM.

Provide a continuous counterpoise of number 4 (minimum) AWG bare, stranded copper wire over the entire length of all primary circuits supplying airfield lighting: outside pavements, with a minimum 2.4 meter (8 foot) ground rod installed at least every 300 meters (1,000 feet). Do not connect counterpoise system to the light bases.

12.1.6.1. COUNTERPOISE CRITERIA.

Along runway/taxiway or apron shoulders, install the counterpoise halfway between the pavement and at approximately half the depth of the duct (or cable, if direct buried) if at all possible. If this is not practical, install counterpoise 10-15 centimeters (4-6 inches) above the duct or direct buried cable. Route the counterpoise around each light base or unit, at a distance of about 0.6 meters (2 feet) from the unit; do not connect to the unit. For duct not along a shoulder or for duct bank, lay the counterpoise 10-15 centimeters (4-6 inches) above the uppermost layer of direct buried ducts, or on the top of the concrete envelope of an encased duct bank. Provide only one counterpoise wire for cables for the same duct bank. Connect all counterpoise wires leading to a duct bank to the single counterpoise wire for the duct bank. Lay the counterpoise at least 0.3 meters (12 inches) from any light cans or in routing counterpoise around manholes or handholes. Do not connect the counterpoise to the lighting vault power grounding system. Use brazing or thermoweld for all connections. The counterpoise resistance to ground must not exceed 25 ohms at any point using the drop of potential method.

Various Counterpoise Requirements.

NAVAIR 51-50AAA-2

12. CABLES.

d. Counterpoise. The wire for the counterpoise shall be a single, bare, copper, No. 4 AWG, stranded conductor. The connections shall be exothermic welds or brazed.

16. COUNTERPOISES.

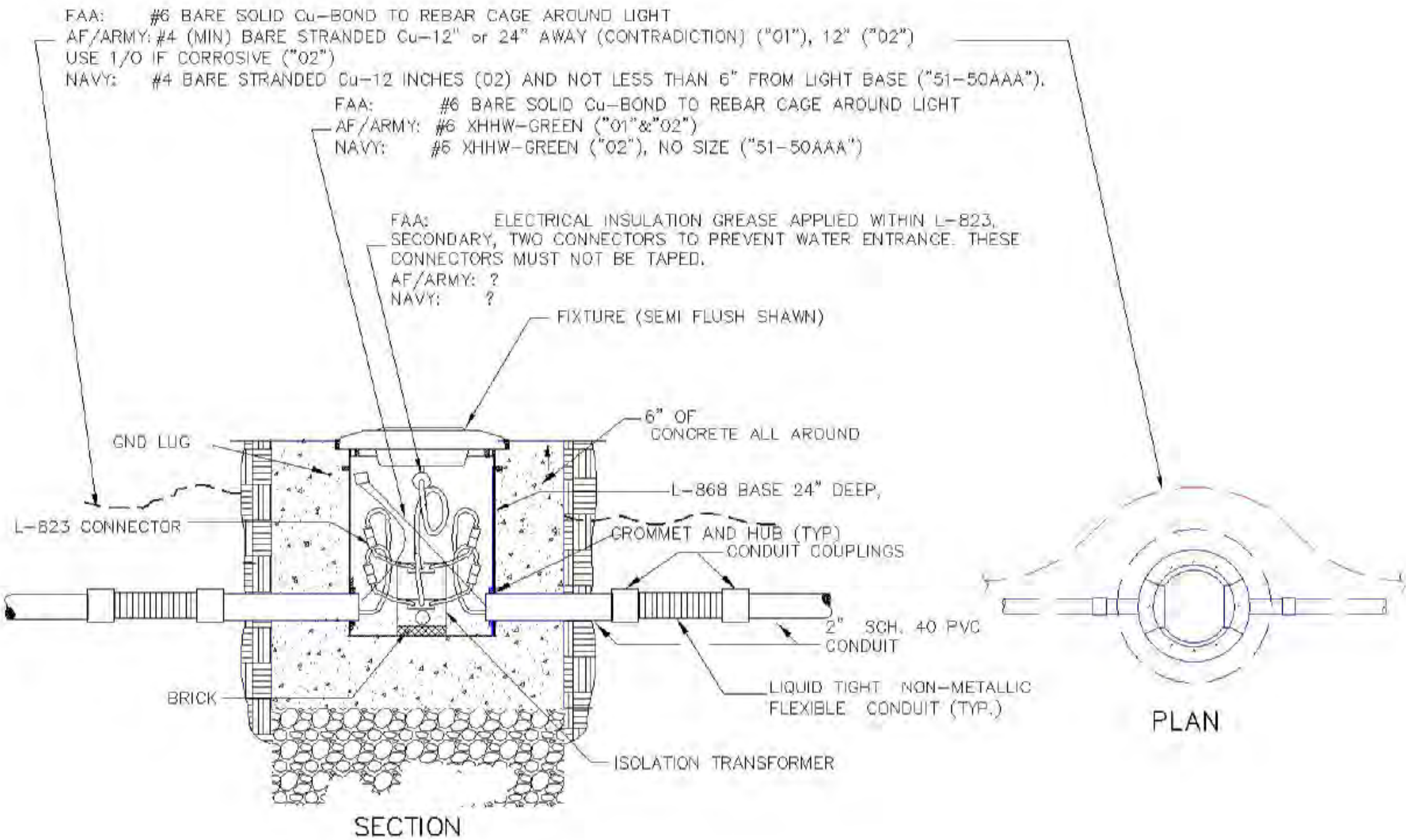
Counterpoises are installed to protect the circuits and equipment from lightning damage. Counterpoises should have a separate grounding system and should not be connected to fixtures or equipment because this may channel the voltage and current from the lightning into the circuit. Counterpoises shall be installed for new circuit installations at Naval Air Station or equivalent airfields and may be installed at auxiliary fields in areas of frequent thunderstorms. The counterpoise shall be bare, stranded, copper wire size No. 4 AWG. This wire shall be installed not less than 4 inches and preferably 6 inches above the circuit which it protects. Except under paved areas the counterpoise should be direct burial and preferably not in direct contact with the duct bank. Not less than 6 inches clearance should be provided between the counterpoise and metal parts of the fixtures and equipment grounds. The counterpoise shall be continuous along the circuit. The counterpoise shall be connected to driven ground rods at the lighting vault, where the feeders connect to the lighting circuit, and at intervals not more than 2000 feet apart along the circuit. The ground rod resistance shall be less than 25 ohms. The ground rods shall be not less than 3 feet and preferably 10 from any equipment grounds. Counterpoises for other circuits shall be connected together where this is practical. The connections of the counterpoise to ground rods shall be exothermic welds or brazed.

Scenario A: Separate Grounding Conductor

- **Equipment Grounding System Assumptions:**
  - #6 Cu insulated (equipment ground), in ducts with primary voltage series circuit.
  - #6 connected to all steel light bases.
  - Ground wires bonded only at the vault, manholes/hand holes, light bases.
- **Counterpoise Lightning Protection System Assumptions:**
  - Continuous counterpoise of #4 bare, stranded Cu wire over the entire length of all primary circuits supplying airfield lighting: outside pavements, with a minimum 2.4 m (8 ft) ground rod installed every 300 m (1,000 ft).
  - Counterpoise system is not connected to the light bases or to the lighting vault power grounding system
  - Series cable is non-shielded in conduit (Schedule 40 PVC).
  - Counterpoise around each light base/unit a distance of 0.6 m (2 ft) from the unit.
  - For duct not along a shoulder or for duct bank, counterpoise to be 10-15 centimeters (4-6 in) above the uppermost layer of direct buried ducts. One counterpoise wire for cables for the same duct bank.
  - Along runway/taxiway or apron shoulders, counterpoise is halfway between the pavement and at approximately half the depth of the duct. Assume light fixture is 1.2 m (4 ft) from the paving.

Different Methods of Lightning Protection & Safety Grounding

Scenario A: Separate Grounding Conductor



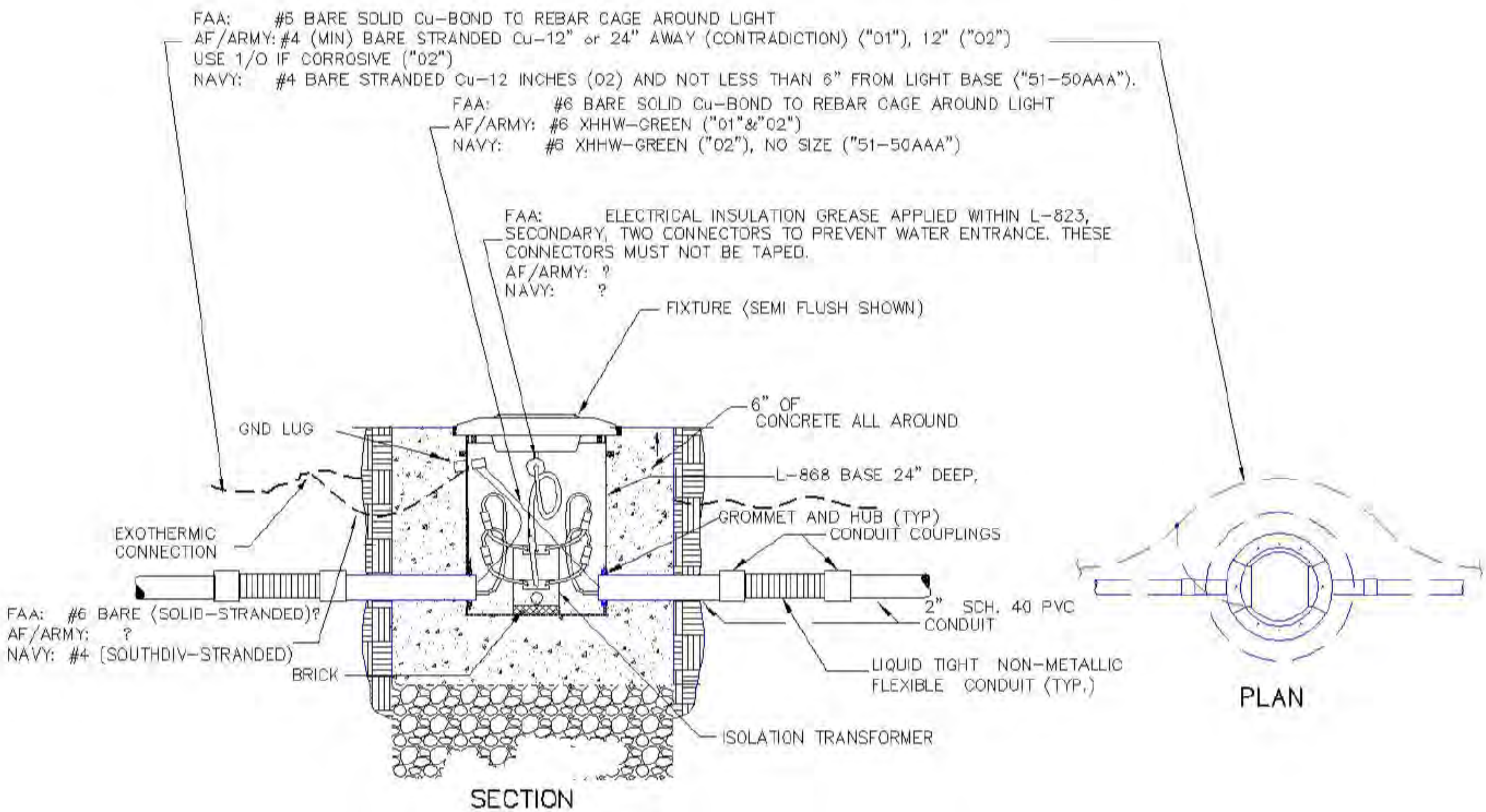
L–868 BASE DEEP CAN METHOD (GREEN GROUNDING CONDUCTOR–SEPARATE COUNTERPOISE)

Scenario B: Interconnected Counterpoise and Separate Grounding Conductor

- **Equipment Grounding System Assumptions:**
  - Same as Scenario A, consisting of insulated grounding conductor connecting metallic fixtures to equipment light bases, except adding light bases interconnected to the counterpoise.
- **Counterpoise Lightning Protection System Assumptions:**
  - Same as Scenario A, except that counterpoise system is connected to the light bases and is connected to the lighting vault power grounding system.

Different Methods of Lightning Protection & Safety Grounding

Scenario B: Interconnected Counterpoise & Separate Grounding Conductor



L-868 BASE DEEP CAN METHOD (GREEN GROUNDING CONDUCTOR CONNECTED TO COUNTERPOISE)

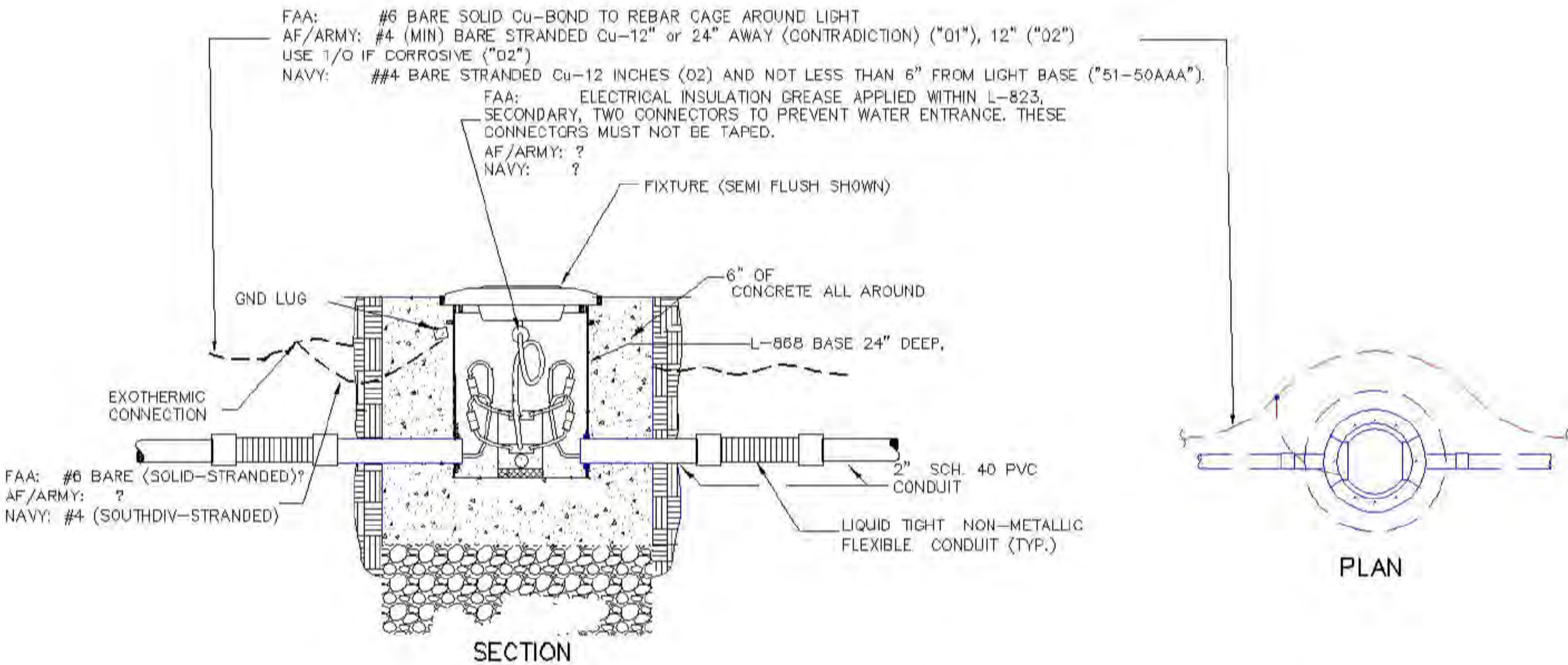
Scenario C: Interconnected Counterpoise without Separate Grounding Conductor

- Equipment Grounding System Assumptions:
  - No insulated conductor included in ductbank system.

- Counterpoise Lightning Protection System Assumptions:
  - Same as Scenario A, except that counterpoise system is connected to the light bases and is connected to the lighting vault power grounding system.

Different Methods of Lightning Protection & Safety Grounding

Scenario C: Interconnected Counterpoise w/o Separate Grounding Conductor



L-868 BASE DEEP CAN METHOD (BASE CONNECTED TO COUNTERPOISE)

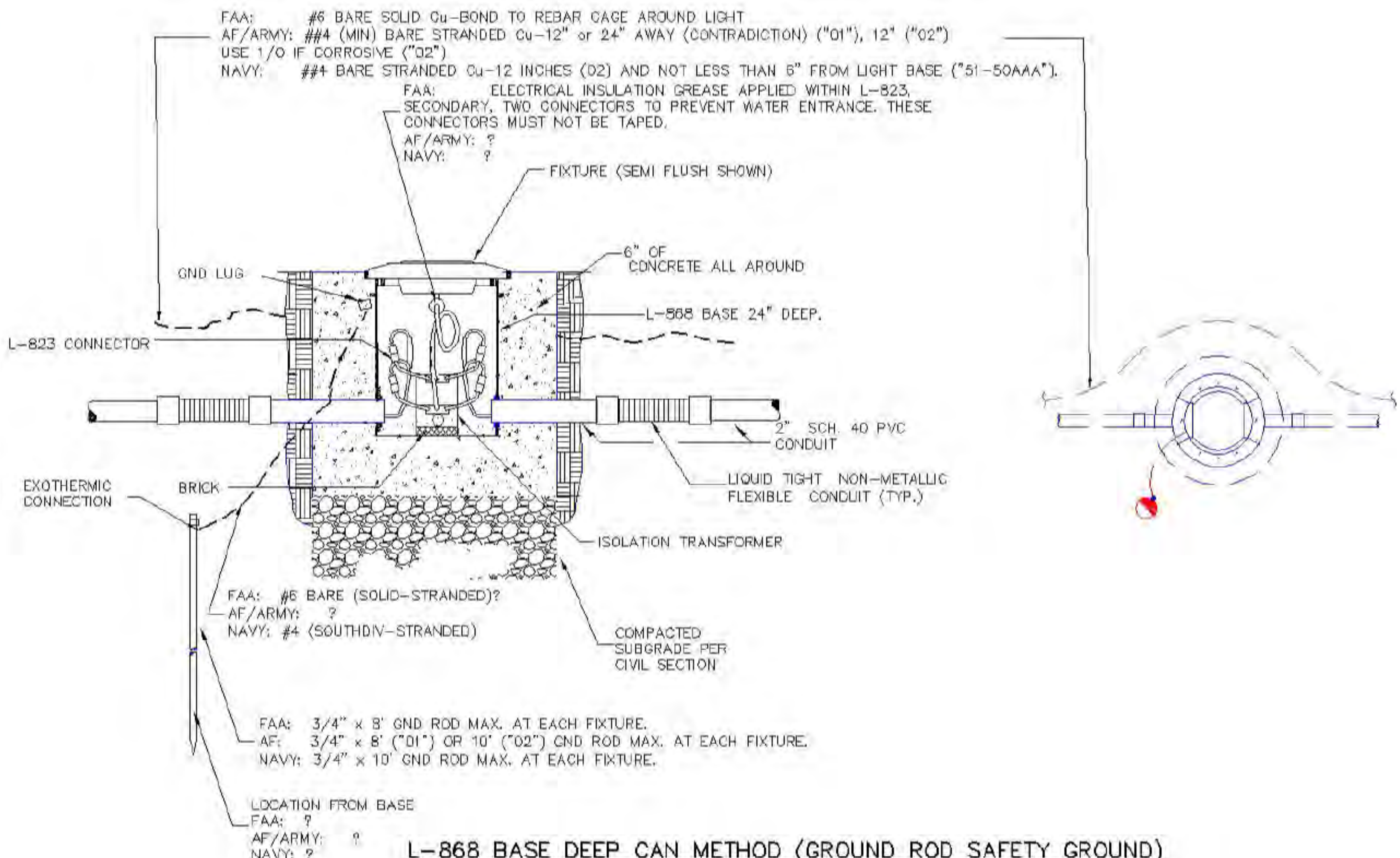
Scenario D: Individual Ground Rods without Separate Grounding Conductor

- **Equipment Grounding System Assumptions:**
  - No insulated conductor included in ductbank system.

- **Counterpoise Lightning Protection System Assumptions:**
  - Same as Scenario A, except that ground rod is installed at each light fixture or group of light fixtures.

Different Methods of Lightning Protection & Safety Grounding

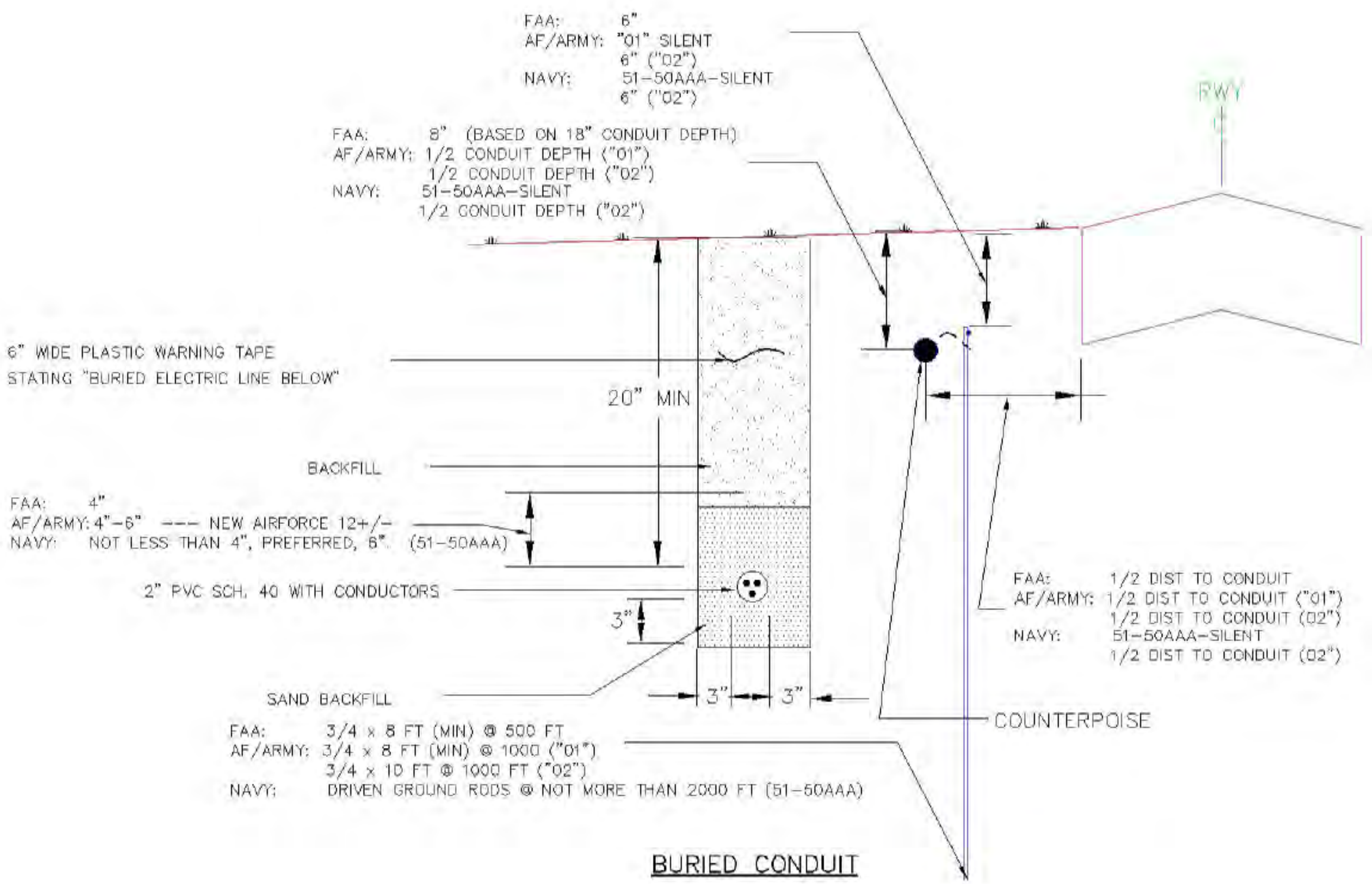
Scenario D: Individual Ground Rods w/o Separate Grounding Conductor



L-868 BASE DEEP CAN METHOD (GROUND ROD SAFETY GROUND)
NO DETAIL PROVIDED FOR GROUND ROD SOLUTION IN UFC

Different Methods of Lightning Protection & Safety Grounding

More Details



The twofold objective of lightning protection is

– To force the current flow where one wants it to go and

– Not to allow the development of hazardous potential differences

Prevent Dangerous Arcing

Equipotential bonding. Ideally, when lightning current causes a properly protected system's potential to rise momentarily to as much as some megavolts, all points of bonded conductors "rise" together

or

Adequate electrical insulation or isolation. Isolating approaches usually depend on whether it is possible or not to separate LPS conductors and other conductors of the system by distances that are larger than the so-called safety distance.

Safety Distance

Adequate isolation distances are required to prevent damaging arcs. These distances are:

D_{air} = 3 m

D_{soil} = 5 m (assumes 60 kA peak current)

Preliminary comments on Scenarios A, B, C, and D

- Scenarios A and D. LPS and safety grounds are separated. These separations are considerably smaller than the safety distances in the soil, which, as estimated above, are of the order of meters. Thus, uncontrolled and potentially hazardous arcing from the counterpoise to a light fixture or to the series cable is likely.

- Scenarios B and C. In Scenario B, LPS and safety grounds are bonded, and in Scenario C the LPS ground is also the safety ground. Arcing between the counterpoise and light fixtures is eliminated and the overall grounding impedance is reduced, since the bonded light fixtures help in dissipating lightning current. However, arcing to the series cable is still possible.

- Additional analysis of scenarios B and C is needed.

Goals

- What is the best solution?
  - –Separate Safety and Counterpoise Systems
  - –Combined Safety and Counterpoise Systems
  - –That is, what is the best topology
- What are the definitive conclusions?
  - –Size counterpoise
  - –Location of counterpoise
  - –Stranded or solid counterpoise
  - –Use of ground rods
- What is the best design solution?

Electrical Military Workshop

Infrastructure Systems Conference

August 05

Electrical- Military Workshop

Professional Development Hours

Monday Through Thursday

19 PDHs

Electrical - Military Workshop

Today (Wednesday)

8:00-9:30	Tri-Service Criteria Overview
10:30-12:00	Lighting Criteria Information Technology Criteria
1:30-3:00	Mass Notification System Electronic Card Access Locks
4:00-5:30	Lightning Protection

Electrical - Military Workshop

Thursday

8:00-9:30 Electronic Security

Airfield Lightning Protection, Grounding & Lighting

10:30-12:00 Electrical Safety and Arc Flash

Electrical Infrastructure in Iraq

Electrical - Military Workshop

Thursday

Training Session

1:00-5:00 2005 NEC Code Changes

Tri - Service Electrical Criteria

Infrastructure Systems Conference August 05

Tri-Service Electrical Criteria

- Origin of Tri-Service Criteria Mandate
- Introduction of Electrical Working Group
- Review of UFC and UFGS Initiatives
- Whole Building Design Guide
- Questions

DOD Unified Facilities Criteria

- **Implemented by 29 May 2002 letter from USD E.C. Aldridge**

- **MIL-STD-3007B, 1 April 2002, Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications**

Tri-Service Electrical Working Group

- Corps of Engineers
  - Bob Billmyre
  - Bob Fite
- Navy
  - John Peltz
  - Richard Cofer
- Air Force
  - Larry Strother
  - Daryl Hammond

Unified Facilities Criteria (UFC)

- Design Criteria to replace TMs, AFMANs, MIL-HDBKs, etc.
- Updates - true Tri-Service documents
- Some existing Documents have been renumbered
- See UFCs on WBDG (http://65.204.17.188/report/doc_ufc.html)

UFC - Progress Overview

Series 3-500 Elect *	5 / 03	7 / 05	200X
Total Scheduled	57	42	22
- Unified	45	23	22
- Air Force Only	5	2	0
- Army Only	4	5	0
- Navy Only	3	12	0
Total Published	2	14	22
- Unified	2	5	22
- Air Force Only	0	0	0
- Army Only	0	3	0
- Navy Only	0	6	0

* (5/03 incl 2 in 4-020 Sec 7/05 incl 7 in 4-0xx Sec)

UFC - Progress Overview (Cont'd)

Series 3-500 Elect	5 / 03	7 / 05	200X
Total In Progress	17	17	0
- Unified	5	14	0
- Air Force Only	5	0	0
- Army Only	4	1	0
- Navy Only	3	2	0
Total In Planning	38	11	0

Unified Facilities Criteria (UFC)

Published, Tri-Service:

3-510-01	Foreign Voltages
3-520-01	Interior Electrical Systems
3-570-06	Cathodic Protection O&M
3-580-10	NMCI Std Constr Practices
4-021-01	Mass Notification Systems

Unified Facilities Criteria (UFC)

Published, Not Tri-Service:

3-501-03 N	Elect Eng Prelim Des Consid
3-540-04 N	Diesel Elect Gen Plants
3-550-03	Exterior Elect Distrib - 2 vers.
3-560-10 N	Electrical Safety
3-570-02	Cathodic Prot Des- 2 vers.
4-020-04 FA	Electronic Security Systems
4-021-02N	Electronic Security Systems

Unified Facilities Criteria (UFC)

Completed, in approval process:

3-530-01	Lighting
3-535-01	Airfield Lighting (Vol I)
3-580-01	Telecom, Inside Plant

Unified Facilities Criteria (UFC)

Final Draft in Review:

3-500-10N	Elect Design (incl design-build)
3-500-05	RF Shielded Enclosures
3-560-01	Electrical Safety
3-575-01	Lightning Protection
4-021-02N	Electronic Security Systems

Unified Facilities Criteria (UFC)

In Progress:

3-500-04	Battery Rooms
3-500-10	Electrical Design
3-535-02	Airfield Lighting, (Vol II)
3-550-01	Exterior Electrical Distribution
3-570-07	Cathodic Protection Design
3-580-02	Telecom, Outside Plant
4-021-XX	Electronic Security PV
4-021-XX	Electronic Security Testing
4-021-02 A	Electronic Security System

Unified Facilities Guide Specs (UFGS)

Simple Concept

- **Existing:** UFGS 16xxxN
  UFGS 16xxxA
- **Updated to:** UFGS 16xxx
- **Master Format – upcoming**
- **Current Listings on WBDG**

http://www.wbdg.org/design/ufg_specs.php

Unified Facilities Guide Specs (UFGS)

Master Format Overview

- Current #'s per 1995 Const Specs Institutes (CSI)
- CSI rev and exp #'s in 2004, see (http://www.csinet.org/s_csi/docs/9400/9361.pdf).
- Previous 16 Divs exp to 49 Divs for rapid dev areas
- Div 13 Sec - to Div 28
- Div 16 Pwr – Most to Div 26, Some to 33
- Div 16 Telcom & Spec Syst – Most Div 27, Some 33
- Div 16 Fiber and VFDs - to Div 40

Unified Facilities Guide Specs (UFGS)

Master Format Overview (Cont'd)

- Navy, Army, Air Force and NASA to MasterFormat 2004
- UFGS sect #'s use new syst to level 4 (XX XX XX.XX)
- Additional level 5 planned to replace the "A" and "N"
  - Instead of "A" use XX XX XX.XX 10
  - Instead of "N" use XX XX XX.XX 20
- Other agencies (NASA, VA, EPA, GSA) joining UFGS would carry extensions (30, 40, 50, etc)
- Goal - Revised # ' s early as Oct 2005

UFGS - Progress Overview

	2003	2005	200X
Div 13 Spec Syst			
- Total	20	21	14
- Unified	2	5	14
- Army Only	9	7	0
- Navy Only	9	9	0
Div 16 Electrical			
- Total	77	64	49
- Unified	2	19	39
- Army Only	36	29	0 (10cw)
- Navy Only	39	16	0

Highlights

- 16050N, Basic Elect Materials & Methods – will be eliminated and content incorp in individual specs
- 16081, Apparatus Inspection & Testing - adopted by all services

Interior Electrical

- 16402 incorp / replaced 16415A & 16402N
- Separate lighting specs & plates –
  - Interior 16510 & Exterior 16520
- Separate sw board & sw gear spec - 16442
- Separate VFD spec16261 - in progress
- Unified UPS spec 16262 – in progress

Unified Facilities Guide Specs (UFGS)

Exterior Electrical

- UG - 16302 in progress incorp 16375A
- Aerial – 16301 in progress incorp 16370A

With separate supporting specs for:

- 3 ph transformers 16272
- 1 ph transformers 16273
- SF6 padmount switchgear 16341N
- Secondary unit substations 16360
- Primary unit substations 16361N

Engine Generators

- Upcoming - Merge 16237N with 16263A & 16264A to create one or two UFGS
- 16230N, 16231N, 16232N, 16233N, 16234N have been eliminated
- 16236N MG sets used by waiver only

Electronic Systems

- Electronic Security - Merge 13720A & 13721A with 13702N & 13703N (in final new draft)
- CCTV – new 16751 in progress
- Telecom – Interior 16710 & Exterior 16711 replaced previous Army and Navy versions

Unified Facilities Guide Specs (UFGS)

Miscellaneous Merges

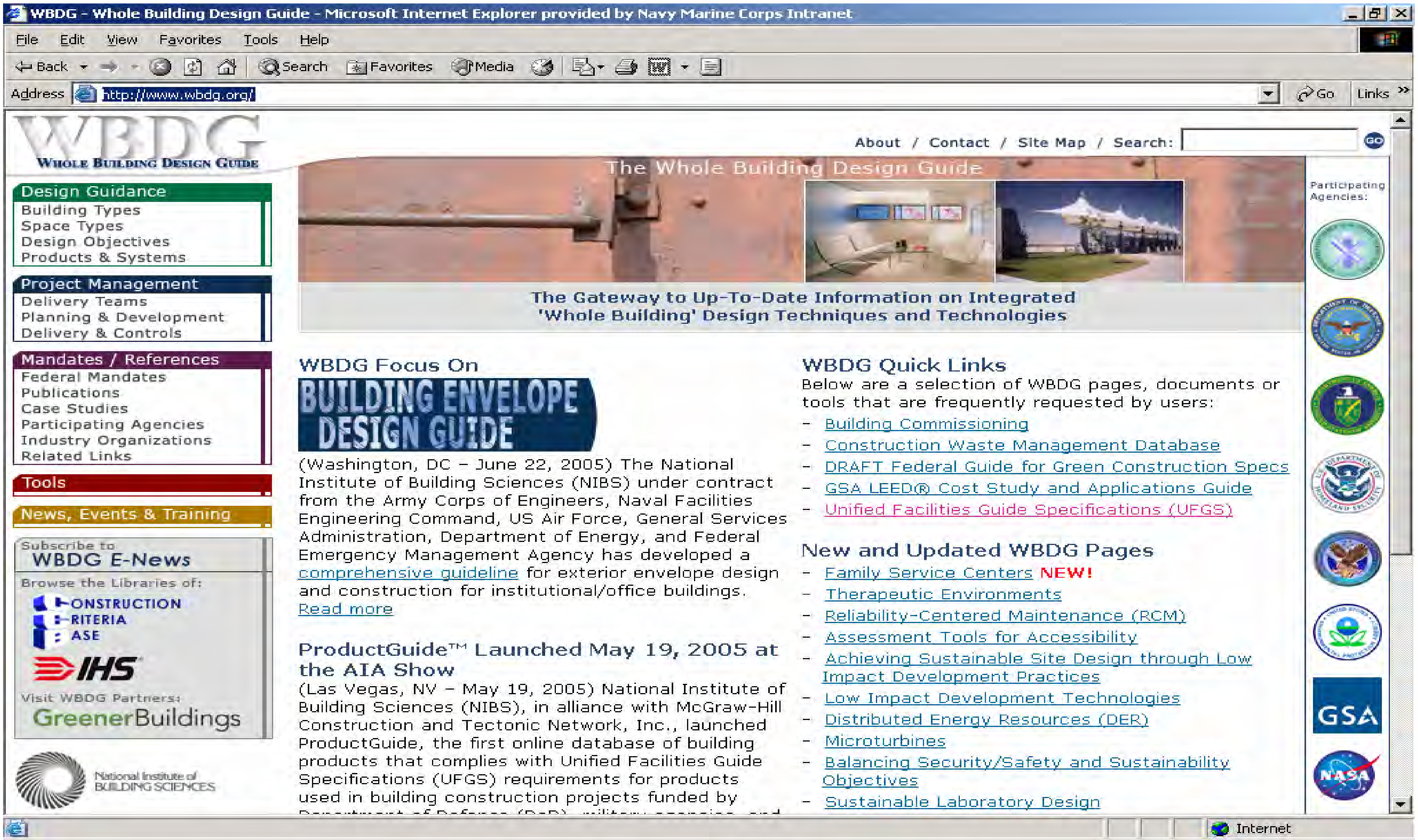
- Airfields - 16522N, 16525A, 16526 A - Planned
- LP- 13100N & 13100A - Final draft in prog
- Cath Prot - 13110-12N, 13110-12A - Planned
- ATS - 16410N, 16410A - In progress
- Intercom - 16721A, 16822N - Final draft in rev
- Shielding - 13092N, 13090A - Planned

Tri-Service Electrical Criteria

Whole Building Design Guide
“htttp://www.wbdg.org/”

- **Links to UFC, UFGS, and Non-Government Standards Contract (IHS)**
- **IHS has most standards referenced in UFGS and UFCs**
- **Link to IHS via Army: “http://www.wbdg.org/pdfs/army_ihs_brochure.pdf”**
- **Link to IHS via Navy: “https://login.ihserc.com/cgi-bin/ihslogin?”**

Whole Building Des Guide (wbdg.org)



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The Whole Building Design Guide

The Gateway to Up-To-Date Information on Integrated 'Whole Building' Design Techniques and Technologies

Design Guidance
- Building Types
- Space Types
- Design Objectives
- Products & Systems

Project Management
- Delivery Teams
- Planning & Development
- Delivery & Controls

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IHS

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National Institute of BUILDING SCIENCES

WBDG Focus On

BUILDING ENVELOPE DESIGN GUIDE

(Washington, DC – June 22, 2005) The National Institute of Building Sciences (NIBS) under contract from the Army Corps of Engineers, Naval Facilities Engineering Command, US Air Force, General Services Administration, Department of Energy, and Federal Emergency Management Agency has developed a comprehensive guideline for exterior envelope design and construction for institutional/office buildings. Read more

ProductGuide™ Launched May 19, 2005 at the AIA Show

(Las Vegas, NV – May 19, 2005) National Institute of Building Sciences (NIBS), in alliance with McGraw-Hill Construction and Tectonic Network, Inc., launched ProductGuide, the first online database of building products that complies with Unified Facilities Guide Specifications (UFGS) requirements for products used in building construction projects funded by

WBDG Quick Links

Below are a selection of WBDG pages, documents or tools that are frequently requested by users:

- Building Commissioning
- Construction Waste Management Database
- DRAFT Federal Guide for Green Construction Specs
- GSA LEED® Cost Study and Applications Guide
- Unified Facilities Guide Specifications (UFGS)

New and Updated WBDG Pages

- Family Service Centers NEW!
- Therapeutic Environments
- Reliability-Centered Maintenance (RCM)
- Assessment Tools for Accessibility
- Achieving Sustainable Site Design through Low Impact Development Practices
- Low Impact Development Technologies
- Distributed Energy Resources (DER)
- Microturbines
- Balancing Security/Safety and Sustainability Objectives
- Sustainable Laboratory Design

Participating Agencies:

GSA

NASA

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Unified Facilities Criteria Program

Unified Facilities Guide Specifications (UFGS)
Unified Facilities Criteria (UFC) Technical Publications
Criteria Change Request (CCR)
Unified Facilities Space Program Spreadsheets

The Department of Defense (DoD) and the military services have initiated a program to unify all technical criteria and standards pertaining to planning, design, construction, and operation and maintenance of real property facilities. The objective of the Unified Facilities Criteria (UFC) program is to streamline the military criteria system by eliminating duplication of information, increasing reliance on private-sector standards, and creating a more efficient criteria development and publishing process. Both technical publications and guide specifications are part of the UFC program. Previously, each service had its own publishing system resulting in criteria being disseminated in different formats. UFC documents have a uniform format and are identified by a number such as UFC 1-300-1.

Though unification of all DOD criteria is the ultimate goal, there are instances when a particular document may not apply to all services, or some documents may have not been fully revised to reflect all service requirements before being issued in the UFC system. In these instances, the UFC or UFGS document number will be followed by an alpha-designator, such as UFC 1-300-09N or UFGS 01320A. Alpha-designators are as follows:

A USACE

US Army Corps of Engineers®

IHS Technical Solutions

NAVFAC

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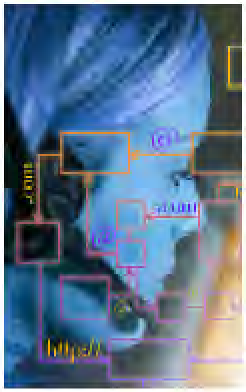
http://www.wbdg.org/pdfs/army_ihs_brochure.pdf



Customer Support

Based on your Customer Service Plan, we can help you use our products more efficiently, provide documents and research assistance, resolve systems or access questions and answer your subscription questions. Please reference your account number, 7838506, when you call.

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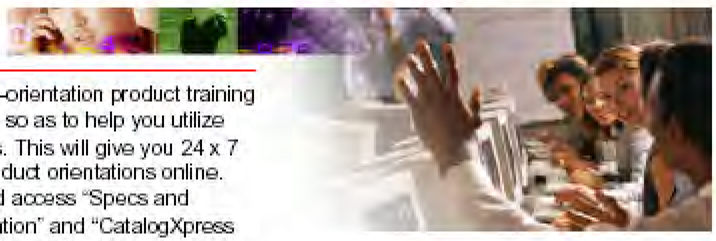
Fax:	303-397-2599
E-mail:	custsvc@ihs.com
Web:	www.ihs.com/support

Training



IHS is providing e-orientation product training via IHS University so as to help you utilize the available tools. This will give you 24 x 7 access to IHS product orientations online. Log on to IHS and access "Specs and Standards Orientation" and "CatalogXpress Orientation" from the main menu.

Accessing IHS Products

Go to the Whole Building Design Guide Website:

http://www.wbdg.org

Choose the DoD Seal from the right. This will open the DoD Unified Criteria Program web page. A link to Information Handling Services is contained in the drop-down menu beneath the USACE seal - "Non-Government Standards - IHS". Click on this link. The web site will automatically log you in to the IHS subscription via your email address.

U.S. Army Corps of Engineers Point of Contact

Robert Billmyre
robert.b.billmyre@hq02.usace.army.mil

IHS Account Number

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“Larry.Strother at tyndall.af.mil”
“Daryl.Hammond at Tyndall.af.mil”

“John.Peltz@navy.mil”
“Richard.Cofer@navy.mil”

Any Questions ? ?

Thank - You ! !

Charleston AFB

Airfield Lighting Vault

Exterior

Interior

Interior

Interior

Interior

Interior

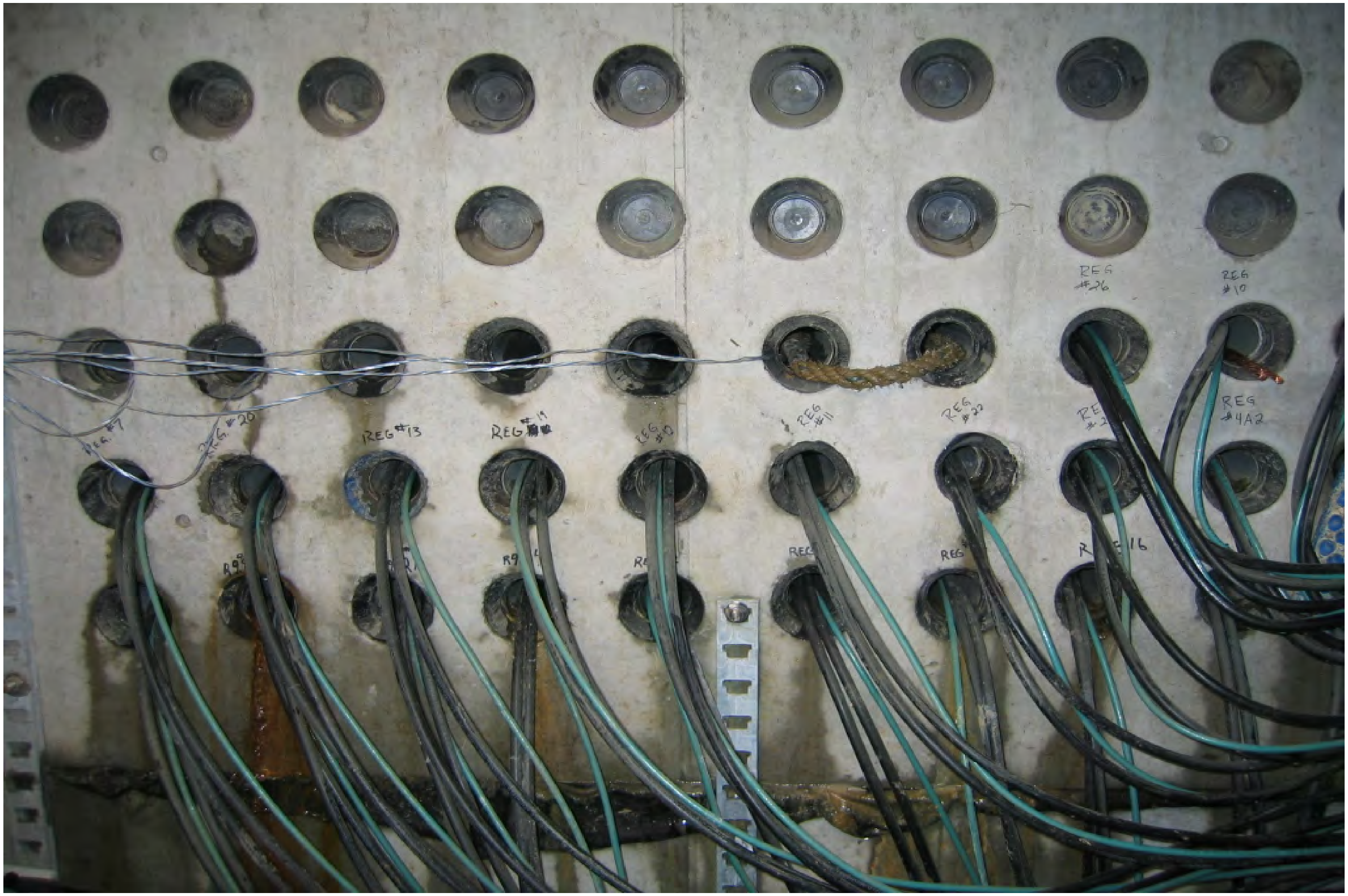
Cabinet

Cabinet

Control Tray

RF Controls

Duct Bank



UNIFIED FACILITIES CRITERIA (UFC)

UFC 3-530-01 Design: Interior, Exterior Lighting and Controls

Nancy Clanton, PE
Clanton & Associates, Inc.

Richard Cofer, PE
NAVFAC Atlantic, ATFP

UFC 3-530-01
Design: Interior, Exterior Lighting and Controls

- Purpose:
  - Provides the criteria necessary to create effective and efficient lighting designs for the wide variety of DoD facilities. It also introduces emerging technologies to further reduce the energy consumption of DoD Facilities.
- Lead Agency: Navy
  - Point of contact: Richard Cofer
- Current Document Status:
  - Base document Completed, awaiting ESEP signatures
  - Adding section on Security Lighting

UFC 3-530-01
FINAL DRAFT
OCTOBER 18, 2004

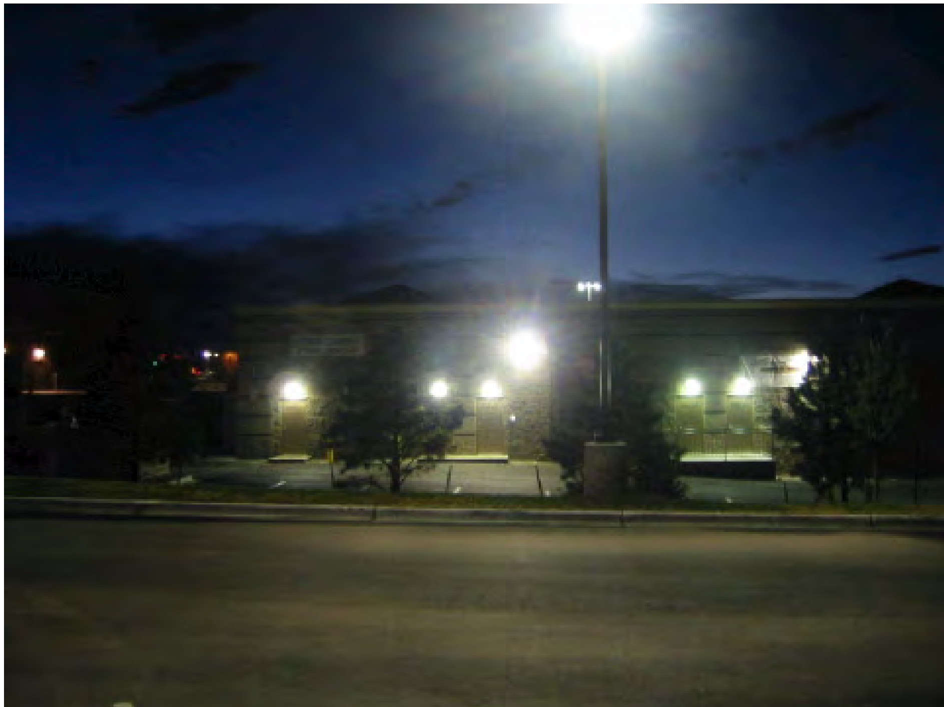
UNIFIED FACILITIES CRITERIA (UFC)

UFC 3-530-01 Design: Interior, Exterior Lighting and Controls

APPROVED FOR PUBLIC RELEASE; DISTRIBUTION UNLIMITED

INTRODUCTION

- This UFC updates the DoD criteria to meet the current IESNA standard of practice 9th Edition Handbook
- Lighting practitioners must evaluate the application and consider the important lighting design criteria including **direct glare, surface luminances, and uniformity**. Also, the importance of **daylight** on human health and productivity is emphasized.
- Exterior lighting design now addresses the **role of glare on creating poor visibility.**



DESIGN CONSIDERATIONS

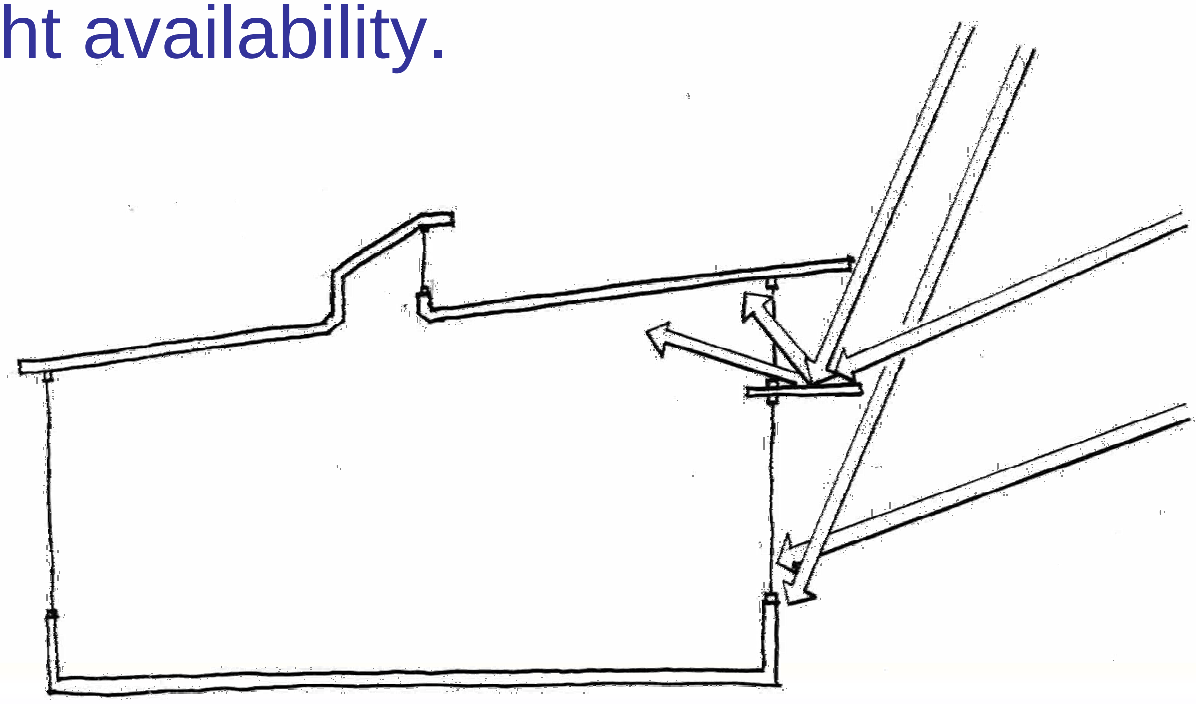
- Minimize glare
- Increase uniformity
- Provide effective illuminance levels
- Light surfaces
- Design ambient/task/accent
- Controls!

SUSTAINABILITY ISSUES

- SPiRiT or LEED rating
- Utilizing daylight reduces energy while improving the quality of the indoor spaces.
- Lighting controls payback in 3 to 7 years
- Minimize Light Pollution / Light Trespass

DAYLIGHTING

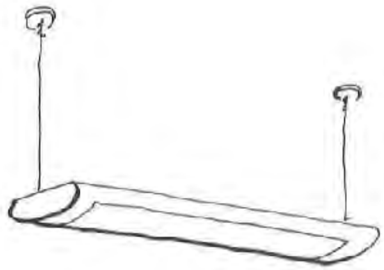
- Maximize daylight potential
- Proper orientation, shading and glazing type and size
- Electric lighting must be controlled in response to daylight availability.

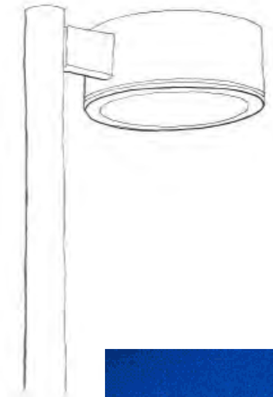


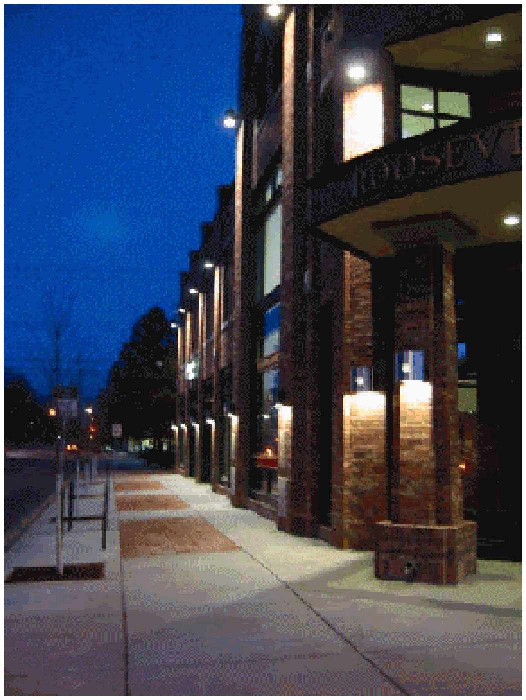

DELI
Pasta

LIGHTING EQUIPMENT

- Luminaires
- Lamps
- Ballasts
- Controls

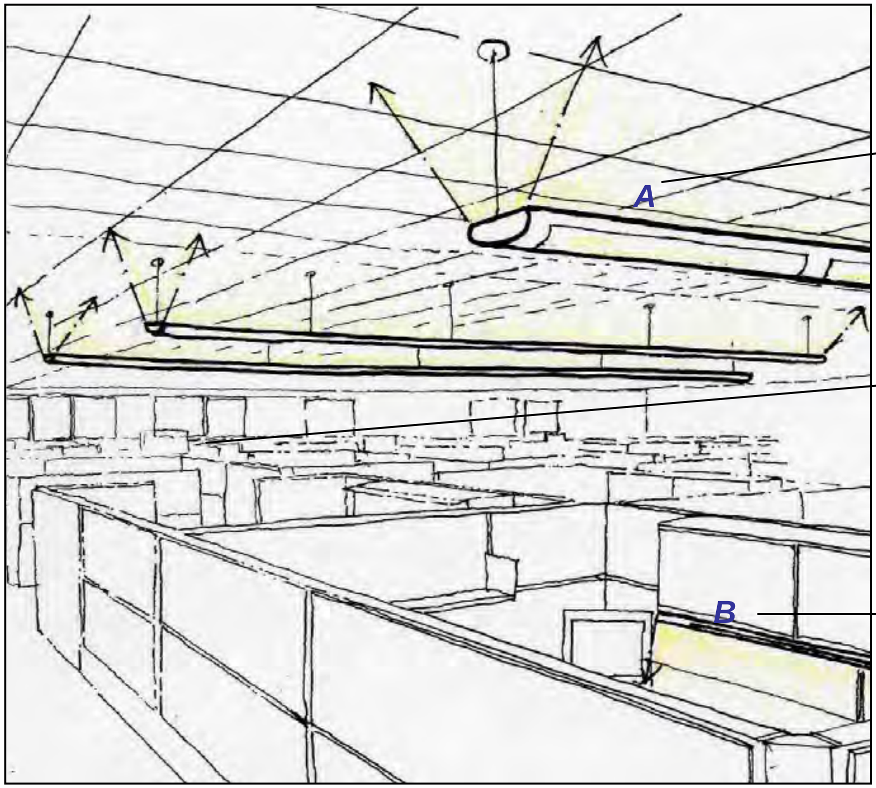






Space Type	Controls Type	Maximum Expected Yearly Energy Savings
Private Office	Occupancy Sensor	45%
	Sidelighting w/ photosensor	35%
	Manual dimming or multilevel switching	30%
Open Office	Sidelighting w/ photosensor	40%
	Occupancy Sensor	35%
Classroom	Multilevel switching	15%
	Sidelighting w/ photosensor	40%
	Occupancy sensor	25%
Grocery Store	Adaptive compensation	15%
	Toplighting w/ photosensor	40%
Big Box Retail	Toplighting w/ photosensor	60%
	Bilevel switching	10%

INTERIOR APPLICATIONS



Pendant mounted direct/indirect luminaires selected and located to prevent direct and reflected glare.

Introduce daylight from north and south facades and control glare. Integrate daylight with electric lighting system where appropriate.

Undercabinet task lights increase illuminance on desks.

EQUIPMENT RECOMMENDATIONS:

LUMINAIRELAMPCONTROLS

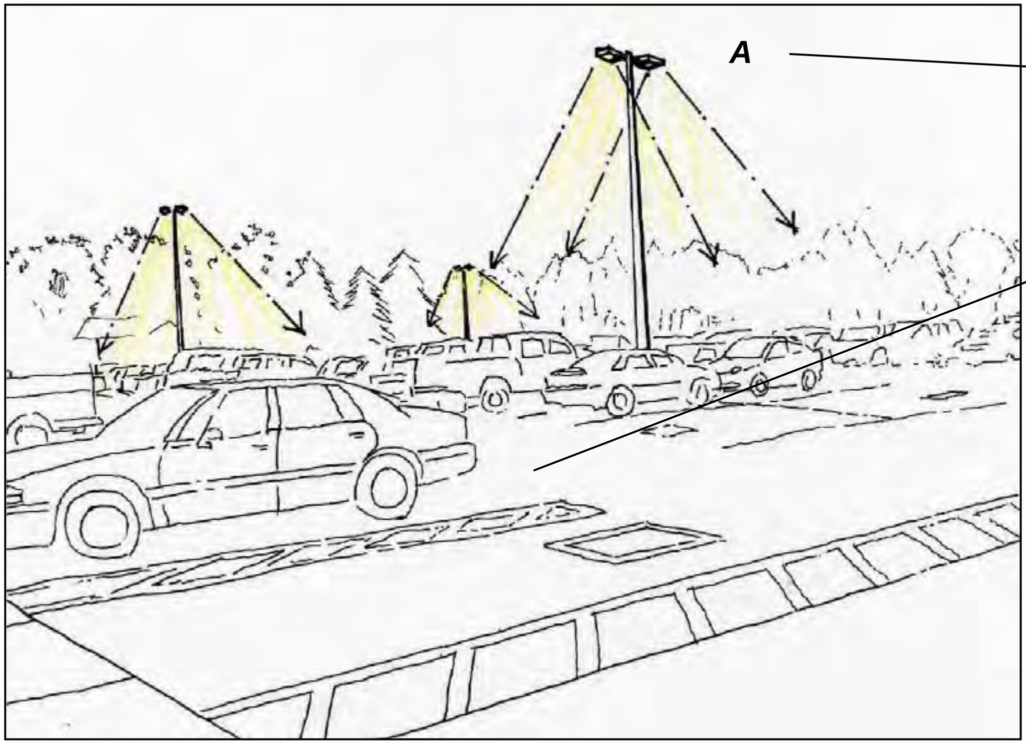
A *Pendant mounted linear fluorescent, indirect / direct luminaire, mounted 0.5 – 0.9m (18" – 36") below ceiling. (There are some luminaires available for ceiling heights of 8' with short pendants.)4' linear fluorescent T8, T5HO lamps 3500K color temperature, 75 CRI +Daylight dimming or switching. Manual dimming over workstations is also available. Consider the use of occupancy sensors for cubicle groups.*

B ***U****nder cabinet task lighting designed for minimal veiling reflections.2', 3', and 4' linear fluorescent T8 lamps 3500K color temperature, 75 CRI +Manual on/off or on local occupancy sensor.*

RULES OF THUMB:

- Pendant spacing: When beginning a design, start with 3.0 – 3.7m (10' – 12') spacing for T8 luminaires (5.5 – 6.0m or 18' – 20' for T5HO systems) and modify accordingly to meet critical design issues.
- Pendant length: Pendant lengths range from 0.5 – 0.9m (18" – 3'). High performance luminaires may achieve a minimum of 0.3m (12") pendant lengths. Specialty luminaires for low ceiling applications may be mounted even closer to the ceiling.
- Lighting Power Density: The lighting power density for open office areas can range from 0.9 – 1.2 watts /square foot.

EXTERIOR APPLICATIONS



Fully shielded or full cut-off luminaires control glare and reduce light pollution and trespass.

Spacing of luminaires provides uniform horizontal illuminance in parking areas.

EQUIPMENT RECOMMENDATIONS:

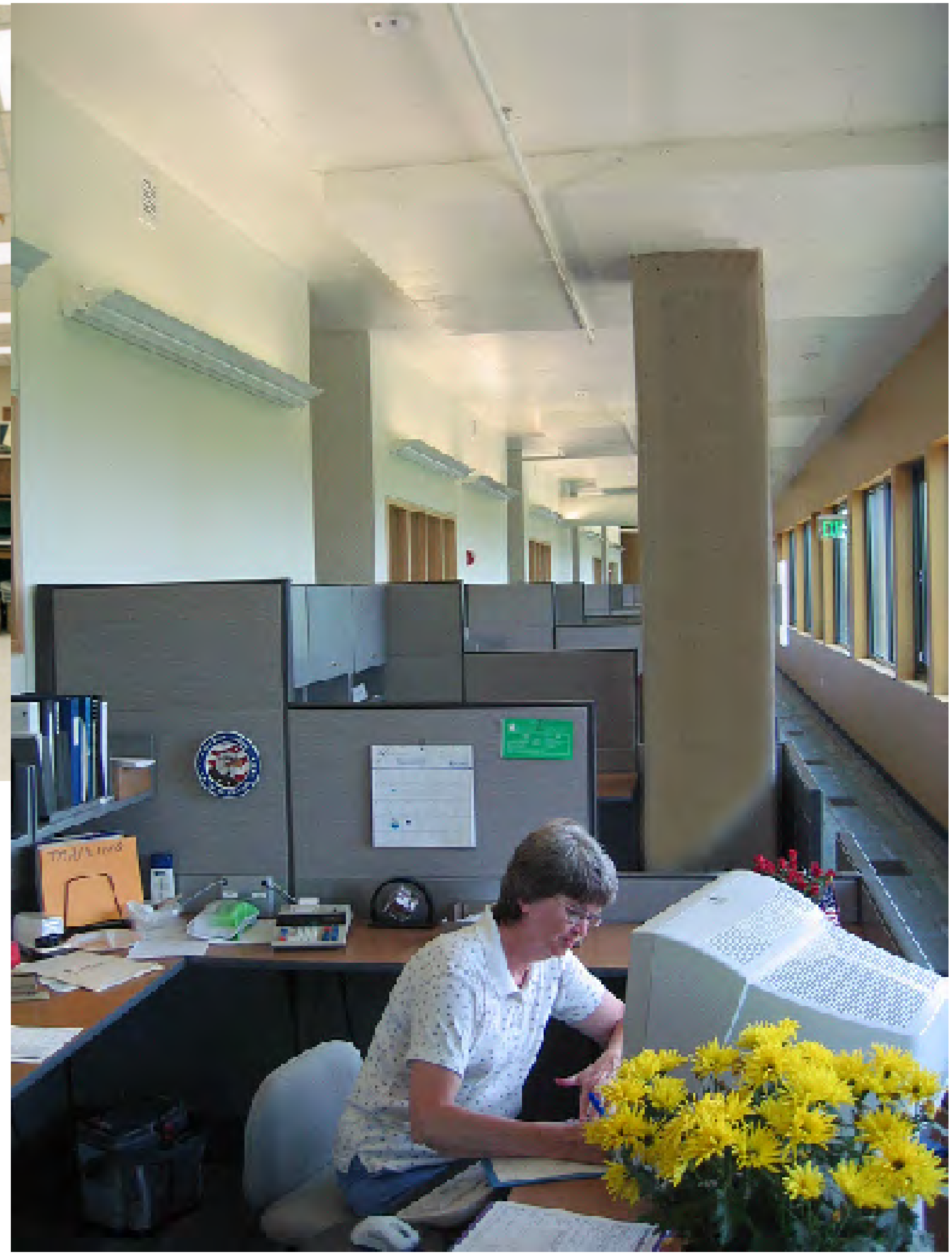
	LUMINAIRE	LAMP	CONTROLS
A	*Pole mounted metal halide, induction, or HPS luminaire.*	*Metal halide, induction, or high pressure sodium lamp.*	*Control with photocell, timeclock, or motion sensor (only with induction lamp).*

RULES OF THUMB:

- Spacing to mounting height:
  Start with a 4:1 spacing to mounting height ratio and modify accordingly to meet critical design issues.

- Distribution: Use Type V distributions for luminaires within the parking areas. Use Type III and IV distributions for luminaires along the perimeters.

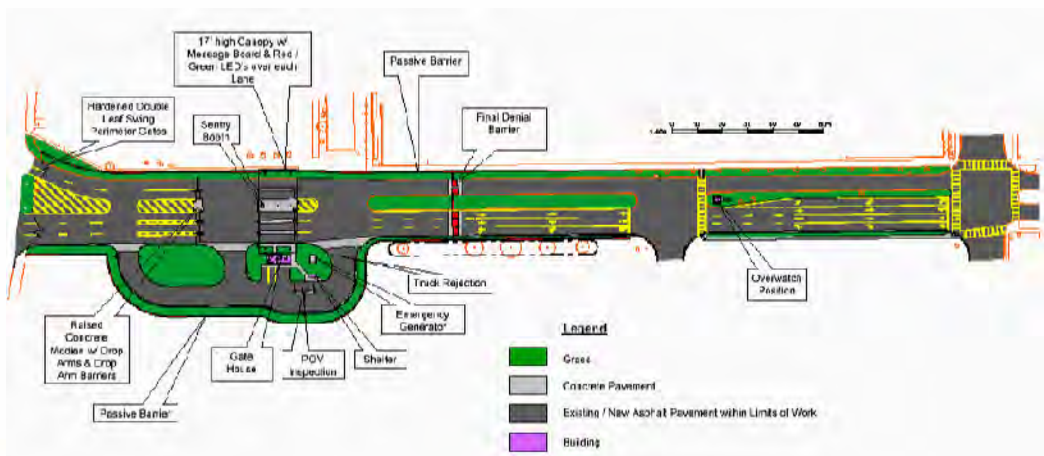
The Old Criteria



The New Criteria

What's Next?

- Security Lighting:
  - Concepts
    - Glare Projection
    - Controlled
    - Light Pollution
    - Lighting for CCTV
  - Facilities
    - Entry Control Facilities
      - Vehicle access
      - Pedestrian access
      - Inspection areas
    - Controlled Perimeters
    - Restricted Areas
    - Storage areas
  - Special Applications
    - Waterfront



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Utility System Security and Fort Future

Vicki Van Blaricum, Tom Bozada, Tim Perkins, and Vince Hock
U. S. Army Engineer Research & Development Center

Presented at:
Tri-Services Infrastructure Systems Conference
3 August 2005

Utility systems <u>enable</u> key installation functions

Force Projection

Training

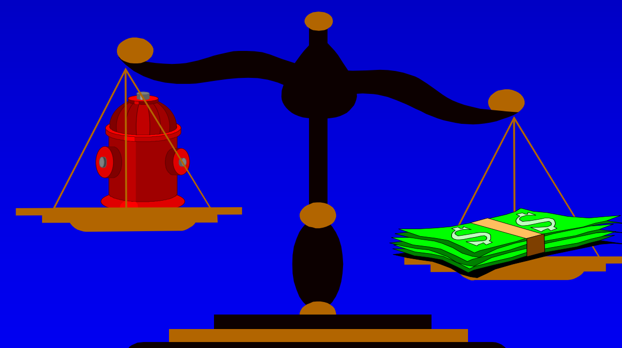
Daily activities

Utility systems must be:

Safe – does not cause harm

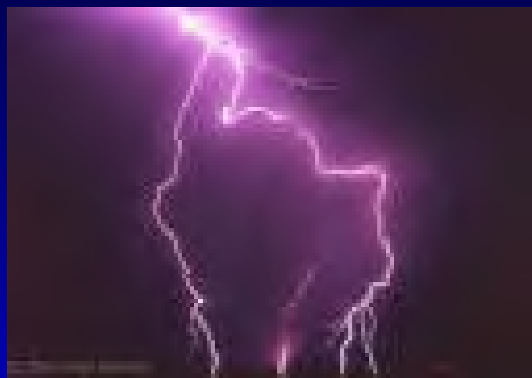
Reliable– always there when it's needed

Sufficient to meet demand– both normal and "surge"



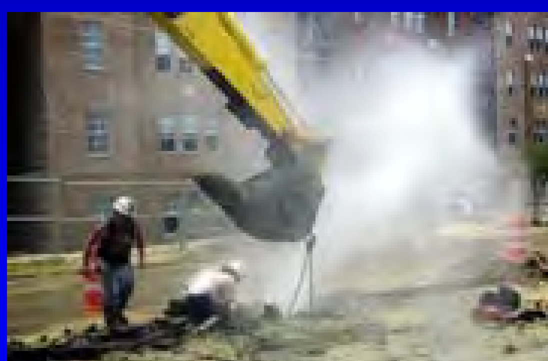
Affordable– a balance between cost & service

Causes for utility service failures



Weather/ natural disasters

Equipment failure



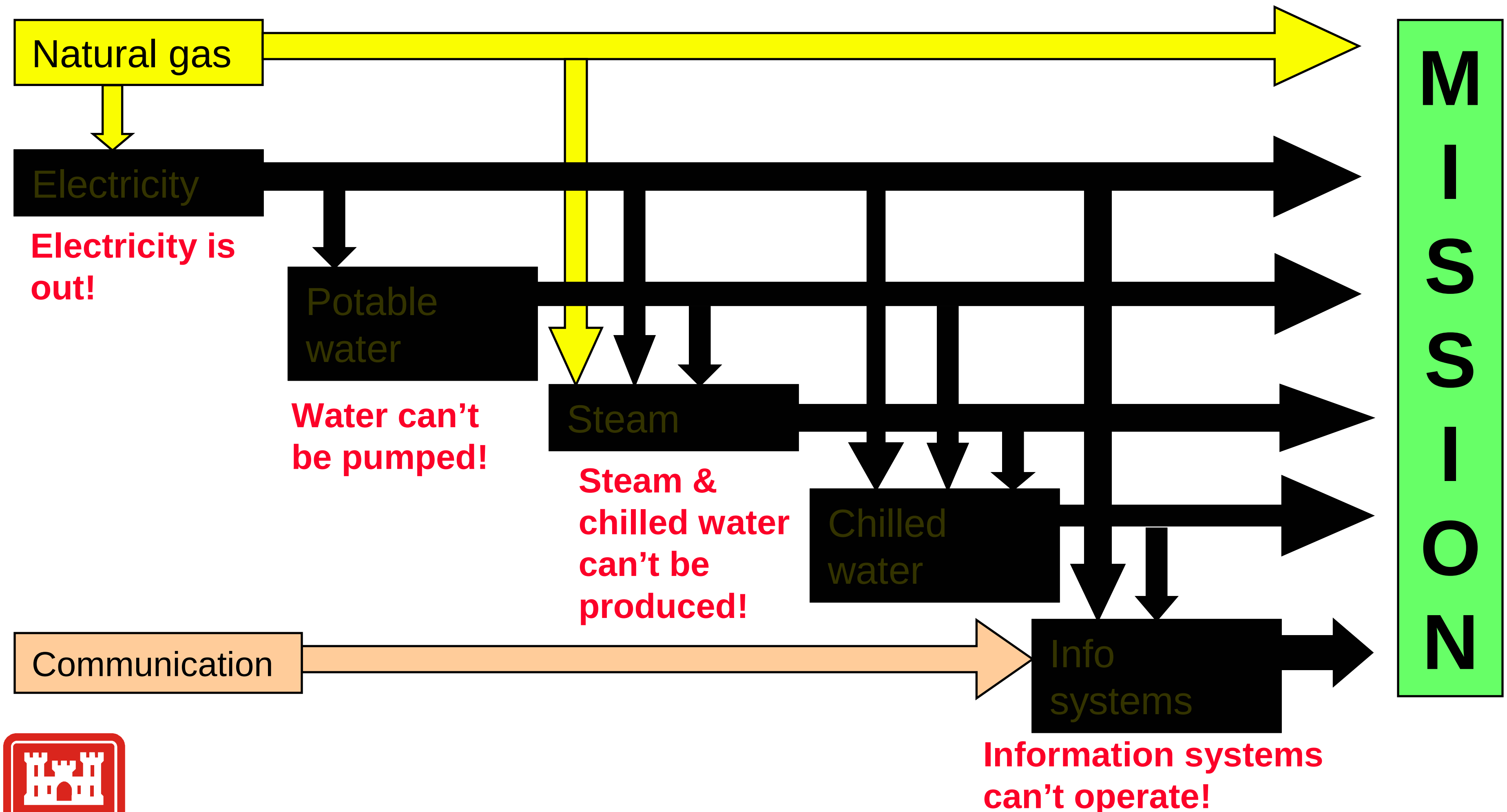
Accident

Terrorism / sabotage / vandalism

Security and Risk

- Decisions must be made because we don't have the resources to protect everything from everything.
- Risk cannot be entirely eliminated, only reduced.
- Risk management is a process that:
  - Considers the likelihood that a threat will endanger an asset, individual, or function
  - Identifies actions to reduce the risk and mitigate the consequences of an attack.

Problem: Utility systems are interdependent…yet traditional risk assessment methods usually consider only one system at a time.



Some Risk Assessment & Management Methods for Utility Systems

METHOD	DEVELOPER
Risk Assessment Methodology for Water (RAM-W)	Sandia National Laboratories
Vulnerability Self Assessment Tool (VSAT)	Association of Metropolitan Sewerage Agencies (AMSA)
Security Vulnerability Self-Assessment Guide for Small Drinking Water Systems	National Rural Water Association
Security Guidelines for the Electricity Sector	North American Electric Reliability Council

Generalized risk assessment procedure

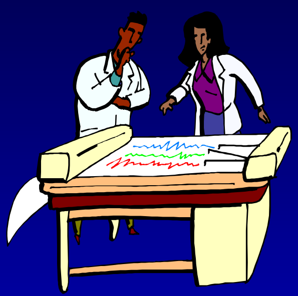
- Characterize the utility system, including its mission and objectives.
- Identify and prioritize critical assets. Critical assets are the utility system components that are determined to be most vital to meeting the system's mission and objectives.
- Assess the threat of emergencies and disasters. Both intentional and unintentional acts should be considered.
- Identify and rank the possible consequences of the identified threats.
- Evaluate existing countermeasures.
- Analyze risk based on the preceding information.
- Analyze alternatives for reducing unacceptable risk.

Problems with traditional utility risk assessment methods

- Application is usually subjective, or semi-quantitative at best
- Focus is on physical security
- Generally ignores interdependencies between utilities (such as "cascade effect" of power outage)

SOLUTION: Use integrated engineering-based simulations to support the risk assessment process.

Types of Utility System Simulations



Steady State Model

"Snapshot" at one point in time

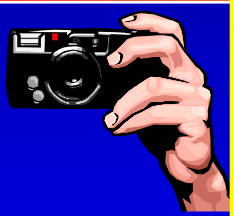
On-line Dynamic Model

Data is obtained from SCADA and model is updated once a day.

Accuracy, functionality and reliability of method

CAD Diagrams, Static Data

"Seat of the pants" methods for dealing with new situations & problems



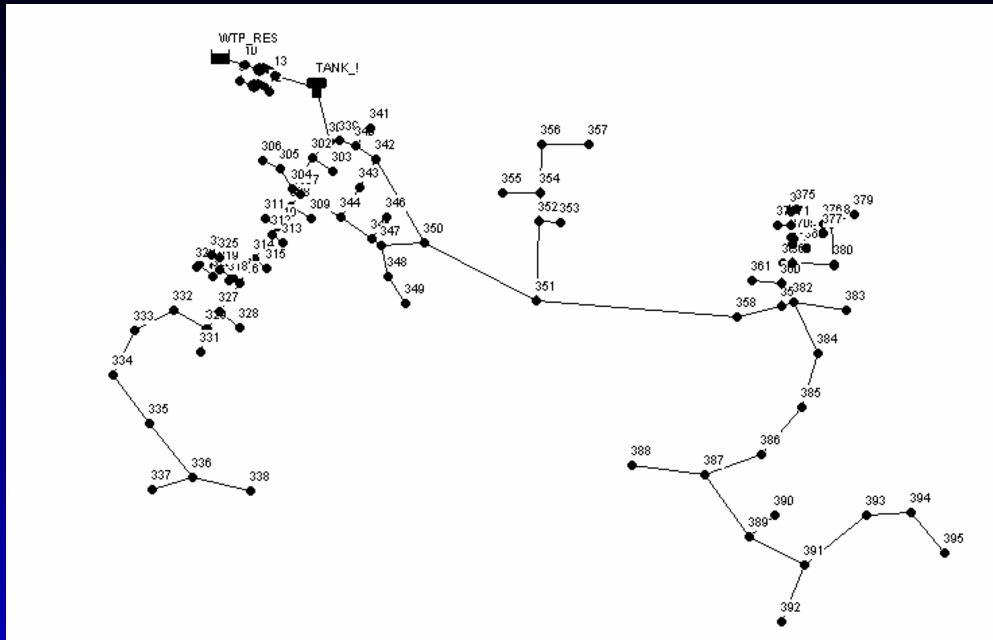
Off-line Dynamic Model

Time-varying processes can be modeled but data input is not automated

'Real-Time' Dynamic Model

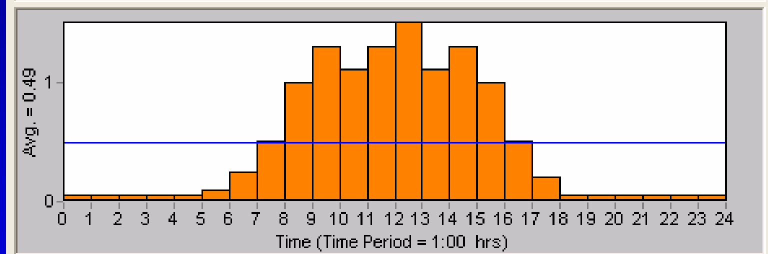
Model updated with SCADA data at intervals of 15 minutes or less.

Example: Creating a water system model



Pattern ID	Description
3	

Time Period	1	2	3	4	5	6	7	8
Multiplier	0.05	0.05	0.05	0.05	0.05	0.1	.25	.5



Pipe 12

Property	Value
*Pipe ID	12
*Start Node	N071
*End Node	N077
Description	
Tag	
*Length	402
*Diameter	10
*Roughness	100
Loss Coeff.	0
Initial Status	Open
Bulk Coeff.	
Wall Coeff.	

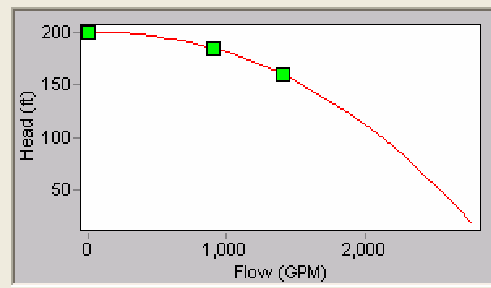
Junction N016

Property	Value
*Junction ID	N016
X-Coordinate	1234.37
Y-Coordinate	-422.92
Description	
Tag	
*Elevation	255
Base Demand	33
Demand Pattern	3
Demand Categories	1
Emitter Coeff.	
Initial Quality	
Source Quality	

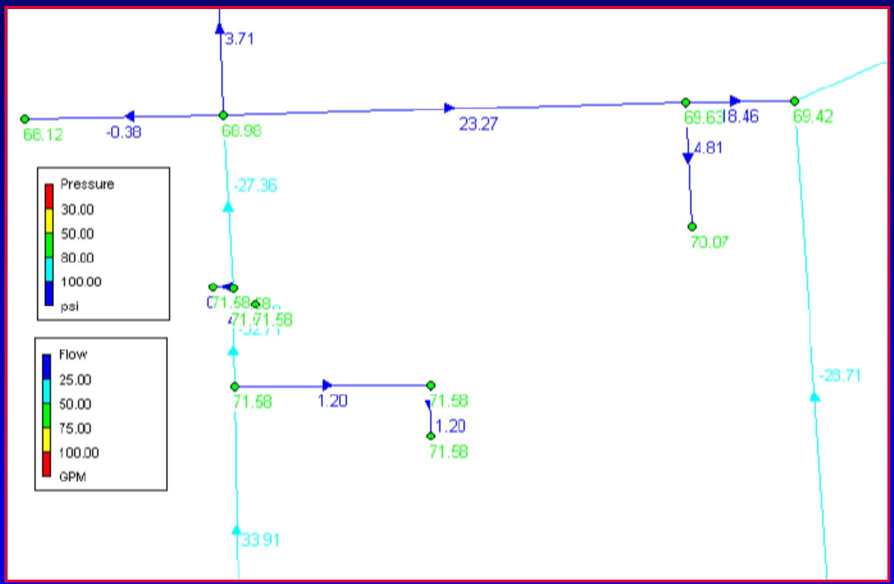
Curve Type: PUMP

Equation: Head = 200.00-4.149E-6(Flow)^2.22

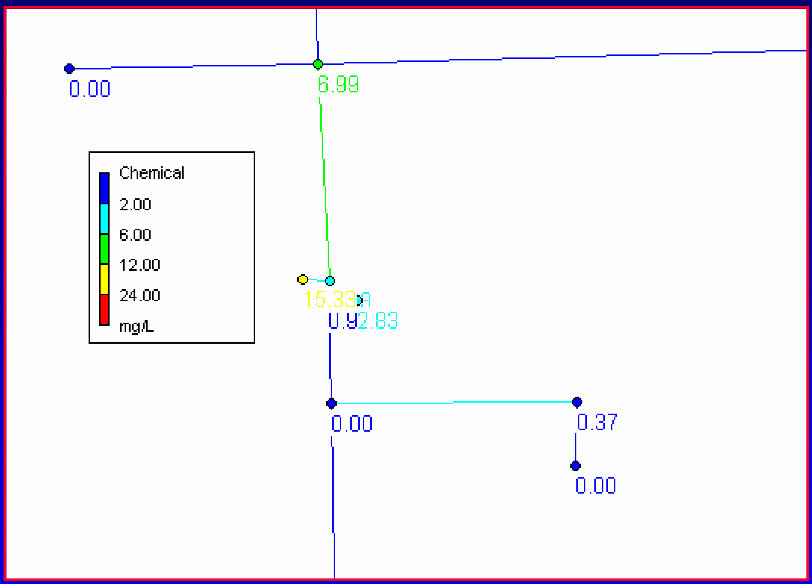
Flow	Head
0	200
900	185
1400	160



Example: Water system model output



Pressures & flow rates



Chemical concentrations

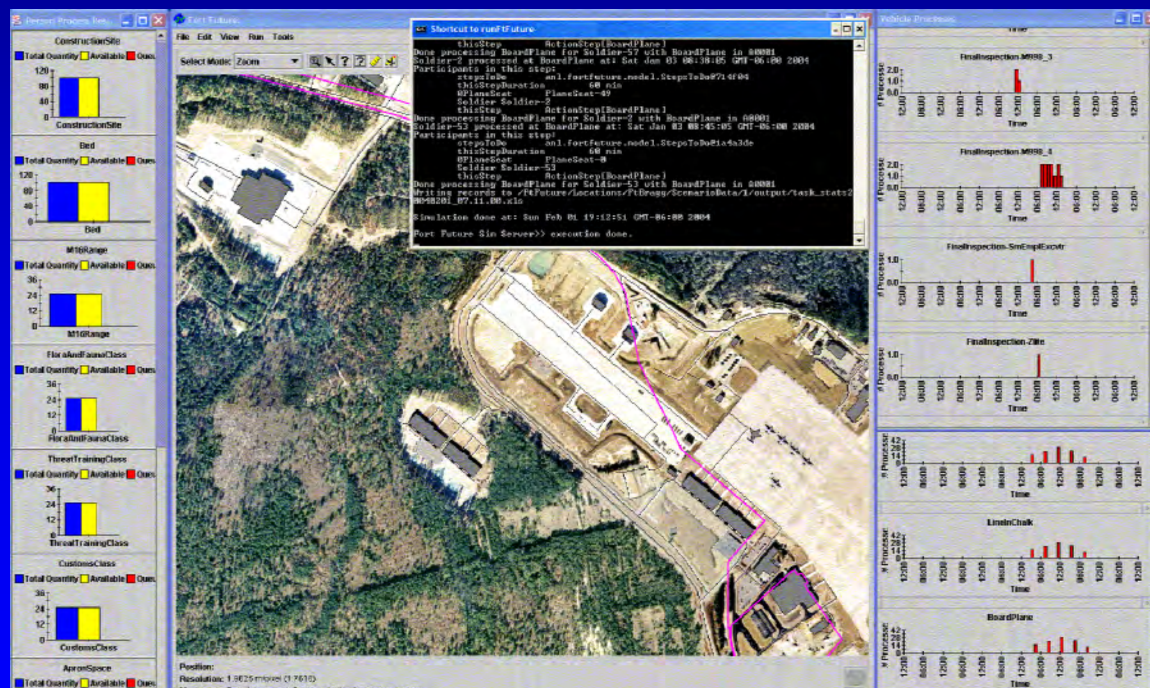
US Army Corps
of Engineers

Engineer Research and Development Center

The Fort Future Virtual Installation

- **Creates a computable model of any geographic location using GIS Data, and standard system characteristics**
- **Integrates processes with infrastructure including utilities**

- **Utilities**
  - **Power**
  - **Water**
  - **Fuel (FY05)**
  - **Natural Gas (FY05)**
- **Process Simulation**
  - **Projection**
  - **Dining Facilities**
  - **Barracks Utilization**



Capabilities of Utilities Simulations within the Virtual Installation

- Describes quantitatively how utility systems will behave under actual or hypothetical conditions
  - Capacity
  - Locations of service interruptions
  - Contamination
- Shows what the results mean
- Allows interdependencies to be considered
  - Between utility systems
  - Activities (process model)

Generalized risk assessment procedure & roles for engineering-based simulations

Step	Description	Can simulations help?
1	Characterize system mission & objectives.	No
2	Identify & prioritize critical assets	Yes
3	Assess threat of emergencies & disasters (intentional & unintentional)	No
4	Determine & rank possible consequences of the identified events.	Yes
5	Evaluate existing countermeasures.	Sometimes
6	Analyze risk based on the above information	No
7	Analyze courses of action for reducing unacceptable risk.	Yes

Step	Description	Can simulations help?
1	Characterize system mission & objectives.	No
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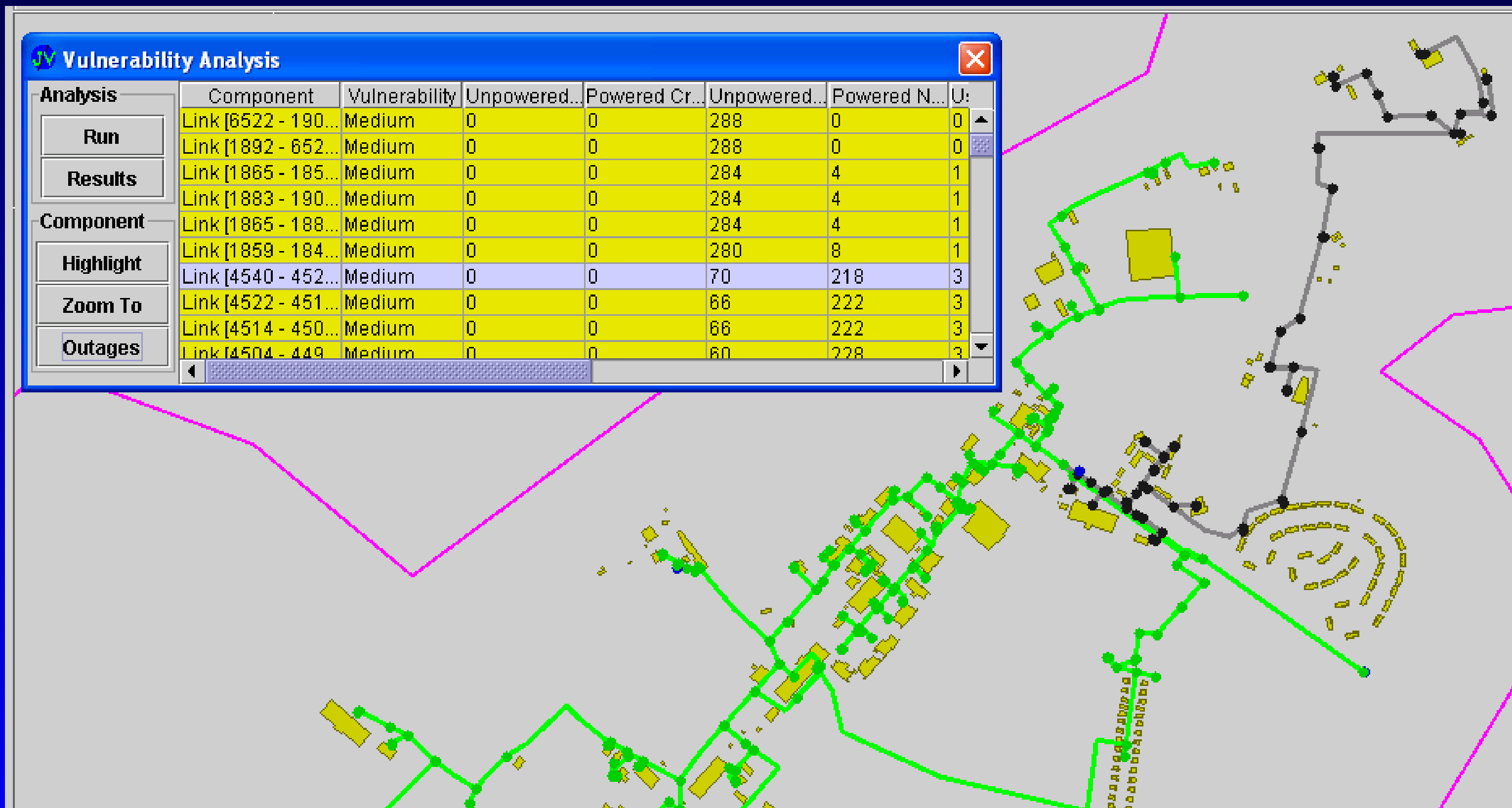
Step 2: Identify & prioritize critical assets

- Critical asset = utility system component that is critical to mission
- Traditional method: Use interviews with system operators and pairwise comparison
- Improved method: Use the system model to simulate asset loss, then evaluate impact quantitatively against mission criteria.
- Greater impact means higher priority

Step 2 Use Case:
Identify & prioritize critical assets



Each system asset is removed from the network and the simulation is run. Assets are ranked according to the impact of their removal (for example, how many "critical consumers" will lose power)

Step	Description	Can simulations help?
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Step 4: Determine & rank possible consequences of the identified events

- Some example consequence measures:
  - Number of users impacted
  - Magnitude of mission degradation
  - Value of infrastructure damaged/destroyed
- Traditional method: Interview system operators and ask them to estimate consequences
- Improved method: Use models to simulate attacks and quantify consequences.

Step 4 Use Case: Determine & rank possible consequences of the identified events

Electrical distribution system is shown in green; water in blue.

Determine & rank possible consequences of the identified events

Scenario: An ice storm has damaged the three electrical lines indicated by XXs. The darkened electrical lines and blackened electrical nodes indicate locations where power has been lost.

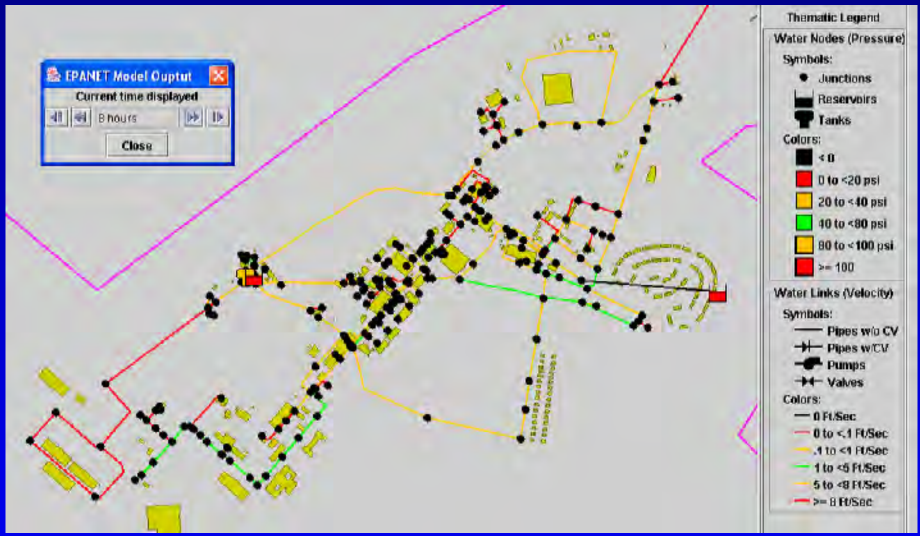
Determine & rank possible consequences of the identified events

It is observed that power has been lost at the water treatment plant. The backup generator at the plant fails to start.

Determine & rank possible consequences of the identified events

How long will adequate pressure be maintained in the water distribution system? The water system simulation is run.

Hour 7



Hour 8

The simulation shows that the water storage tank maintains pressure for 7 hours. <u>At hour 8, the supply is exhausted.</u>

Step	Description	Can simulations help?
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6	Analyze risk based on the above information	No
7	Analyze courses of action for reducing unacceptable risk.	Yes

Step 6: Analyze risk based on above information

- **Example: In RAM-W for water systems:**

$$Risk=P_A*(1-P_E)*C$$

P_A = Potential for adversary attack (threat)

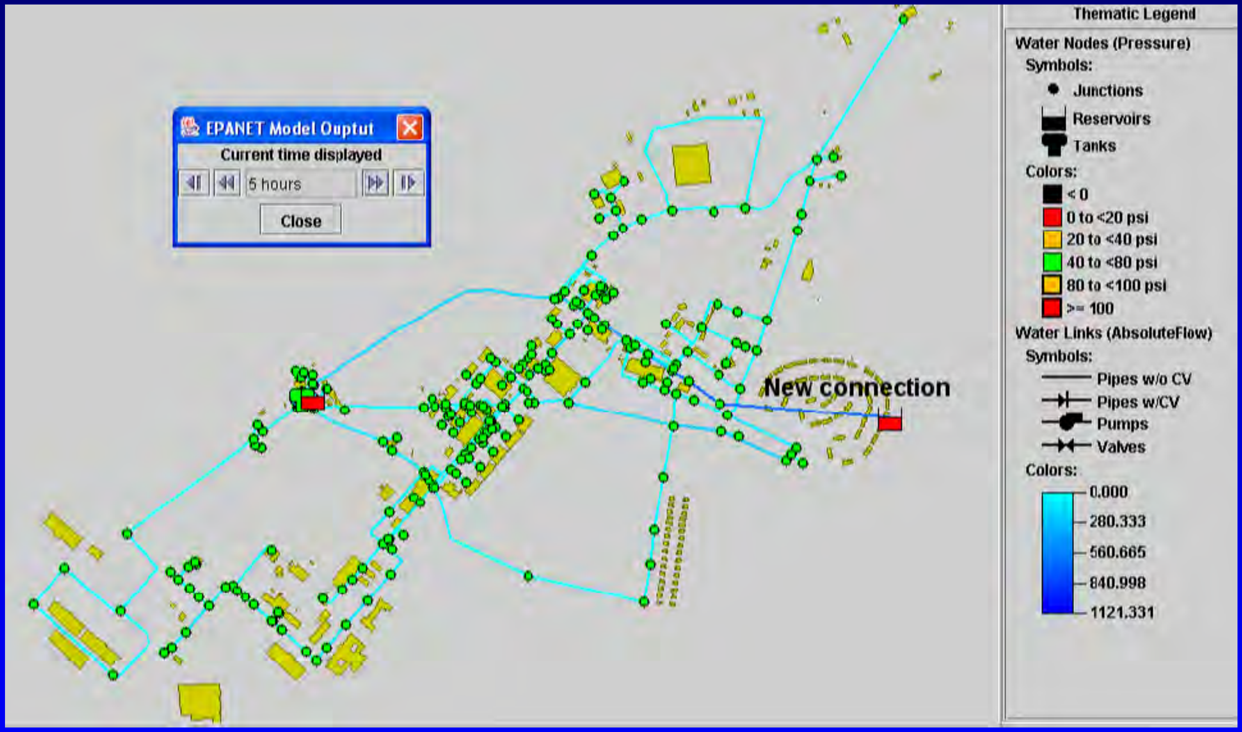
P_E = Effectiveness of protection systems

C = Consequence

- **Is the identified risk level acceptable?**

Step 7 Use Case: Analyze courses of action for reducing unacceptable risk.

One possible course of action for reducing risk in the power outage scenario is to add a "backup" connection to the municipal water system.



The power outage is simulated again.
The new connection begins delivering water 5 hours after the outage.
Pressures are maintained adequately.

The Future: On-Line Dynamic Simulations

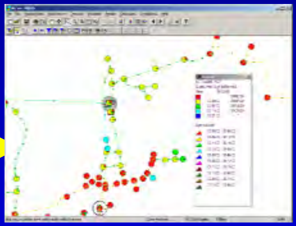
Flow sensor

Remote Terminal Unit

Water system outfitted with sensors and RTUs

Connection via LAN and/or radio

Master computer for SCADA system

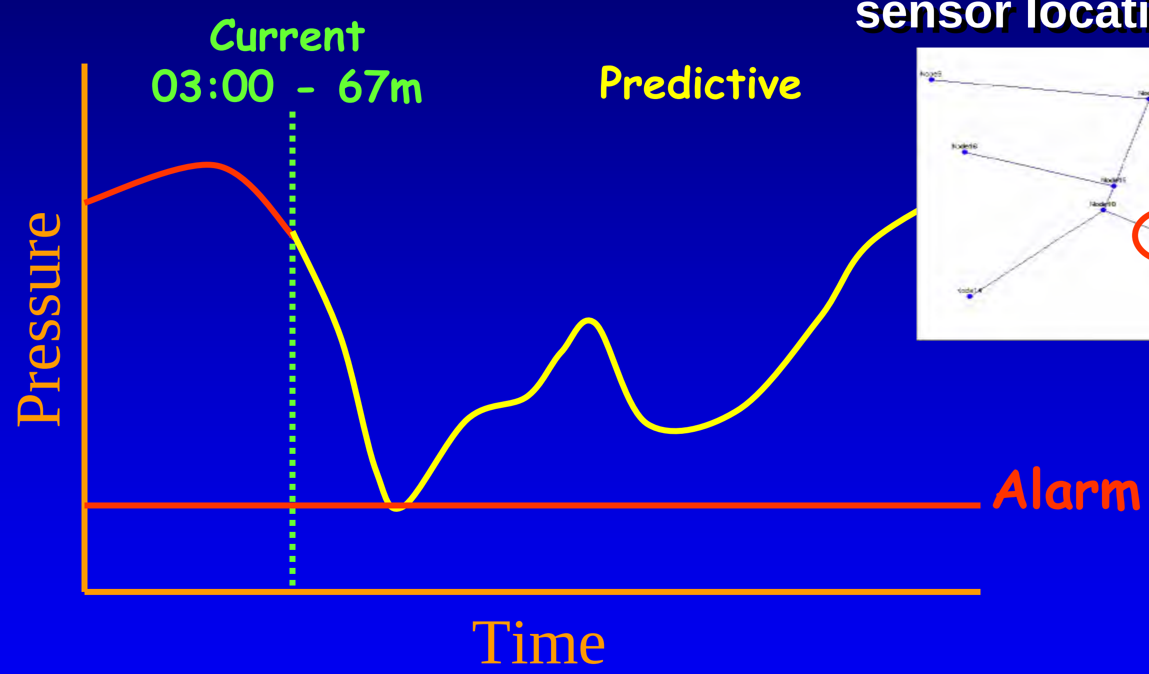


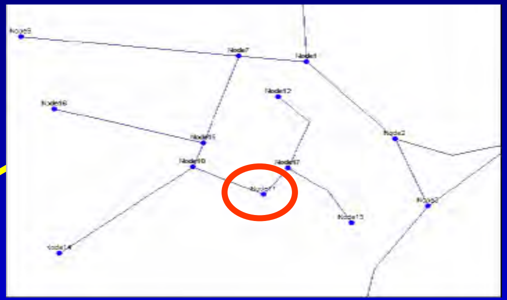
Utility system models

RTU = Remote Terminal Unit
SCADA = Supervisory Control and Data Acquisition
LAN = Local Area Network

Real time modeling allows proactive identification of problems

System behavior at all locations is extrapolated from relatively few sensor locations.





The operator always knows what is happening everywhere in the water system.

Summary

- Risk management is a method for prioritizing allocation of limited security and reliability resources
- Fort Future Virtual Installation can be used to overcome some known difficulties in utility system risk assessment
- It provides quantitative, engineering based information and analysis to help overcome knowledge gaps and reduce subjectivity

ELECTRONIC KEYCARD ACCESS LOCKS

Presented by
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AUGUST 3, 2005

YESTERDAY WAS MECHANICAL

- Manual Key Control
  - Pinning charts
  - Manual record keeping
  - Inventory of keyways
  - "DO NOT DUPLICATE"
  - Key cutting machine
  - Keys cut improperly

Today is Electronic

- Computerized Key Control
  - Electronic Database
  - Automatic record keeping
  - Inventory of keycards
  - User name assigned to the keycard
  - Keycard Encoder
  - Keycard code verified when encoded
  - New keycard recodes lock upon insertion

PRIMARY BENEFITS

- Lock is re-keyed upon insertion of new Keycard
- Stand alone battery power eliminates hard wiring
- Lower installation cost since there's no wires to pull
- Keycards are identified by NAME or NUMBER
- Memory keycards remember where they have been
- Control entry by assigning specific times
- Lock captures date, time, and ID of who entered
- Multiple levels of Master Keying available
- Permits mechanical key override using IC Cores

HISTORY

- 1970's First battery powered locks arrive
  - Used Optic Technology
  - Punched hole cards
  - Easily duplicated
  - Small Microprocessor 8k
  - 8 Keycard levels
- 1980's First Magnetic Keycards arrive
  - Magnetic Stripe eliminated keycard duplication
  - Keycards became reusable
  - Audit trail is added with 14 audits
  - Relative time is added
  - Keycard ID is added
  - Microprocessor grows 32k
  - 16 keycard levels

MORE HISTORY

  - Microprocessor grows to 64K
  - Audit trail grows to 40 audits
  - Time parameters are added
- 1990's
  - Hardware becomes available to effectively secure most openings
  - Microprocessor grows to 128K
  - Audit trail grows to 250 audits
  - LED Diagnostics is added
  - Motors replace solenoids

STILL MORE HISTORY

- Exterior applications become standard
- Automatic deadbolt is introduced
- Smart Card technology arrives
- Memory Card Technology arrives

- 2000's
  - Expanded Memory arrives
    - Audit trail grows to over 5,000 audits
  - Bi-directional communication arrives
  - Systems interfacing becomes common place
  - Windows Operating System replaces DOS

LOCK SPECIFICATIONS

- Mortise Lock
  - 1 inch “Automatic Deadbolt”
  - ANSI Grade 1 equals 800,000 cycles
  - UL Listed for 3 hours
  - Available with knobs and/or levers
  - 600 pound shearing point
    - Access is still denied
  - Accepts Interchangeable Core mortise cylinder
  - Available with 1 inch or 1¼ inch lock front
  - Selection of designs and finishes

SYSTEM SPECIFICATIONS

- Computer Selection
- User friendly Windows software
  - On-site Training
  - Factory Training
  - Interactive Training CD
- Keycard Encoders
  - Motorized
  - Insertion
  - Swipe
- Handheld Lock Programmer
- Emergency Lock Power Supply
- Electronic Lock

ELECTRONIC LOCK FEATURES

- 16 Levels allows for application specific design
- Timed access
  - Assigned onto the keycard
  - Assigned to the lock
- Keycard Identification
- Multiple Zones
- Multiple Masters
- Inhibit Keycards
- Electronic Lockout
- Limited Use Keycards

MORE FEATURES

- Emergency Keycard
- Dual Keycard ~ High Security
- Mechanical Key Override
  - Accepts Interchangeable Core Cylinders
- Auto Latch ~ Auto Unlatch
- LED Diagnostics
- Interface Capabilities
- Multi-Technology
  - Lock Accepts Magnetic Stripe Keycards
  - Lock Accepts Memory Keycards
  - Lock Accepts Smart Keycards

ANCILLARY HARDWARE

- Remote Controllers
  - Elevators
  - Narrow stile aluminum & glass doors
  - Power assisted doors
- Exit Devices
  - Rim Devices
  - Vertical Rod Devices
- Magnetic Locks
- Electric Strikes
- An Authorized Keycard can open all doors

ENDLESS APPLICATIONS

- Energy Control
- Wireless Bi-directional Communication
- Point of Sale
- Photo Identification
- Auto feed encoders
- System Interfacing
- Customer Service 365 ~ 7 ~ 24

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AUGUST 3, 2005

BACnet®
Technology Update

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David.M.Schwenk@erdc.usace.army.mil

Terminology

- BACnet® is 'Building Automation and Control Network'
  - Standard data communications protocol developed by ASHRAE
- BACnet Manufacturers Association (BMA)
  - Formed in Jan 2000 to encourage the successful use of BACnet in building automation and control systems, through interoperability and compliance testing, educational programs, and promotional activities
- BACnet Testing Laboratories (BTL®)
  - Part of BMA, offers a product testing and listing program for products that have BACnet capability

Terminology

- "Native" BACnet implies that the devices only speak and understand BACnet. The devices may be interconnected using any of the approved LAN technologies (Ethernet, ARCNET, MS/TP, LonTalk, BACnet/IP)

http://**www.bacnet.org**/Tutorial/HMN-Overview/sld026.htm

Terminology

- BIBB: BACnet Interoperability Building Block
  - Based on objects and services
  - Collection of one or more services that function to define the interoperational capabilities of a BACnet device
  - Certain BIBBs may also be predicated on the support of certain, otherwise optional, BACnet objects **or** properties
  - BIBBs may also constrain allowable values of specific properties or service parameters

http://www.**aamatrix.com**/bacnet/bacnetdefinitions.shtml

Terminology

- **Services** are client-server messages
  - Alarm & Event
  - File Access
  - Object Access
  - Remote Device Management
  - Virtual Terminal

http://www.**bacnet.org**/Tutorial/HMN-Overview/sld023.htm

Terminology

- **Object**
  - Represents data in a defined data structure. Each object has a set of **properties** and a group of functions that can be applied to them.
  - BACnet defines objects to represent control system data
  - BACnet objects can represent information about a physical input or output, a file or a logical grouping of data that performs some function (a setpoint or schedule, for example)
  - By prescribing an object-model method to represent all control system data, BACnet facilitates interoperability and extensibility.
  - 23 different object types (AI, BO, averaging, schedule, etc.)

http://www.**aamatrix.com**/bacnet/bacnetdefinitions.shtml

Terminology

- **Property**
  - A characteristic or parameter of an **Object**
  - Properties of a file object in BACnet, for example, may include file size, type, and modification date
  - In BACnet, certain properties of an object may be required, while others may be optional

http://www.**aamatrix.com**/bacnet/bacnetdefinitions.shtml

Terminology

- **Device Profile**
  - Basically a named collection of BIBBs
  - Annex L defines 6 standard profiles that describe typical collections of BACnet capability in terms of the BIBBs that might be supported by each profile
    - B-OWS Operator Workstation
    - B-BC Building controller
    - B-AAC Advanced application controller
    - B-ASC Application specific controller
    - B-SA Smart actuator
    - B-SS Smart Sensor (not shown at BTL site)

Terminology

- PICS: Protocol Implementation Conformance Statement
  - Manufacturer supplied document (spec sheet)
  - Identifies all portions & options of BACnet implemented in a device
- PICS content:

a) Vendor & device description

b) BIBBs supported by the device (see Annex K)

c) Device Profile to which the device conforms, if any (see Annex L)

d) All non-standard application services that are supported along with an indication for each service of whether the device can initiate the service request, respond to a service request, or both

e) List of all standard and proprietary object types that are supported

f) For each object type supported,

1. any optional properties that are supported,
2. which properties can be written-to using BACnet services,
3. if the objects can be dynamically created or deleted using BACnet services,
4. any restrictions on the range of data values for properties.

g) Supported data link layer option options, both real & virtual. (See Annexes H and J).

h) Whether segmented requests and segmented responses are supported

BACnet Status

Not Ready. Don't use it.

High risk of problems

Specifications not available.

Implementation methodology/guidance not available.

Useful criteria available in approximately 1 year.

BACnet Criteria – Status

- Navy has lead
- Navy draft spec developed - July 05
  - Navy sent to industry for review
- Navy developing plan/report - Sep 05
  - One or more UFGS? One or more UFCs?
  - UFC content
  - Drawing needs? Edit & use (existing) LONWORKS drawings?
- CERL met with 7 BACnet vendors, BMA, and BTL
  - Mostly very productive cooperation
  - Several vendors actively helping with criteria (Points Schedule)

UFGS = Unified Facilities Guide Spec
UFC = Unified Facilities Criteria

UFGS / UFC Packaging

One or more UFGS? One option: "5 specs"

- LONWORKS only (UFGS-15951 and UFGS-13801)
- BACnet only (UFGS 15955 and 13xxx ???)
- Controls only (UFGS-15xxx)
  - Sensors/actuators, execution, sequences

One or more UFCs? One option: "3 UFCs"

- LONWORKS UFC
- BACnet UFC
- Controls UFC

UFGS = Unified Facilities Guide Spec
UFC = Unified Facilities Criteria

Specifying BACnet Data

- Need method to specify BACnet data to be shared/ exchanged over network
  - To meet project application requirements and to ensure interoperability and thus functional requirements
  - It largely comes down to device **properties**
  - Leave it up to the Contractor and you'll get what you deserve
- Can't assume devices will contain needed properties…
- BIBBs & device profiles do not sufficiently describe actual application data shared over the network, and
- Objects have so many properties (both optional & required), it may not be practical to show all on a 'Points' drawing

Managing Network Data

- Unlike LONWORKS, BACnet neither specifies nor requires a std database/image of network. Each vendor has/uses own.
- Interoperability achieved (in part) through 'discovery' process
- Discovery: Vendor uses their tool (software) to query network & uses that info to create a vendor specific database
- 'Discovery' not conceptually bad, but in application has limitations:
  – Not all devices can be 'discovered'. (MSTP slave devices)
  – Brute force method is required to query/discover slave devices
  – Not all needed objects/properties will necessarily exist in 'discovered' devices

Cross-Network Device Configuration

- Vendors may use protocols other than BACnet for device configuration
  - These protocols may not be supported by the entire multi-vendor network (from OWS to the end device)
  - Device configuration may require physical access to the device (can't do it over the network)
  - Therefore, this is a problem with multi-vendor BACnet systems
- Example… 3rd party BACnet Building Controller (B-BC) functioning as a router from Ethernet to MSTP likely will not pass another vendor's non-BACnet device configuration communications

Conformance Testing & BTL Listing

- Device testing more rigorous than LONWORKS ‘certification’ process
- Testing for 5 classes of device profiles.
- OWS conformance testing not ready. 1 year to go.
- Vendors seem to prefer spec ‘BTL Listing’ requirement

Network Security

- Same “Networthiness” challenge as LONWORKS
- Need to get vendors up to speed

OWS = Operator Workstation

Other Issues/Lessons Learned

- PICS defines how a vendor's device implements BACnet
  - As important as a data specification sheets when reviewing a submittal for BACnet components/systems
- XML
  - ASHRAE is defining XML applications for BACnet
  - Web interface to automation & control systems
  - Not ready. Wait and see.
- Use Annex J of the BACnet standard. Annex H routers are old technology and not compatible.

XML = eXtensible Markup Language

LonWorks (ANSI 709)

- Certification process available and in progress
- Many devices available
  - Not all encompassing
- Application specific controllers are common
- Single platform/tool for device configuration possible
- Flat architecture w/single media
- Less defined supv. functions
  - Fewer options/functionality
  - Alms/scheduling/trends
- Standard database/mgmt available (UFGS reqmt)
- Easier to understand/specify
- Can be proprietary

BACnet

- Conformance testing process available but incomplete
- Fewer devices available
  - Not all encompassing
- Programmable controllers seem more common
- Multiple vendor-specific tools required for device configuration
- Hierarchical architecture/media
- More defined supv. functions
  - More options/functionality
  - Alms/scheduling/trends
- Proprietary databases/mgmt
- Kinda tough to understand/specify
- Can be proprietary

Army Energy Strategy & Campaign Plan

- Eliminate energy waste in existing facilities
- Increase energy efficiency in new construction and renovations
- Reduce dependence on fossil fuels
- Conserve water resources
- Improve energy security

DDC/UMCS is necessary to support these goals!

http://hqda-energypolicy.pnl.gov/programs/plan.asp

BACnet Summary

- BACnet is not ready for implementation
  - Specifications not ready
  - Implementation methodology/guidance not available
- Develop some in-house expertise / familiarity now
- Be prepared to hire/procure a Systems Integrator whether you adopt BACnet or LONWORKS (recommend: IDIQ)
- Probably not wise to implement BACnet *and* LONWORKS
- CERL recommends LONWORKS, but recognizes potential of BACnet and wants to see it implemented intelligently

Unified Facilities Criteria (UFC) 3-560-02, Electrical Safety

John Peltz, PE
NAVFAC Atlantic, CIEE

Eddie Davis, PE
Edan Engineering Corporation

UFC 3-560-02, Electrical Safety

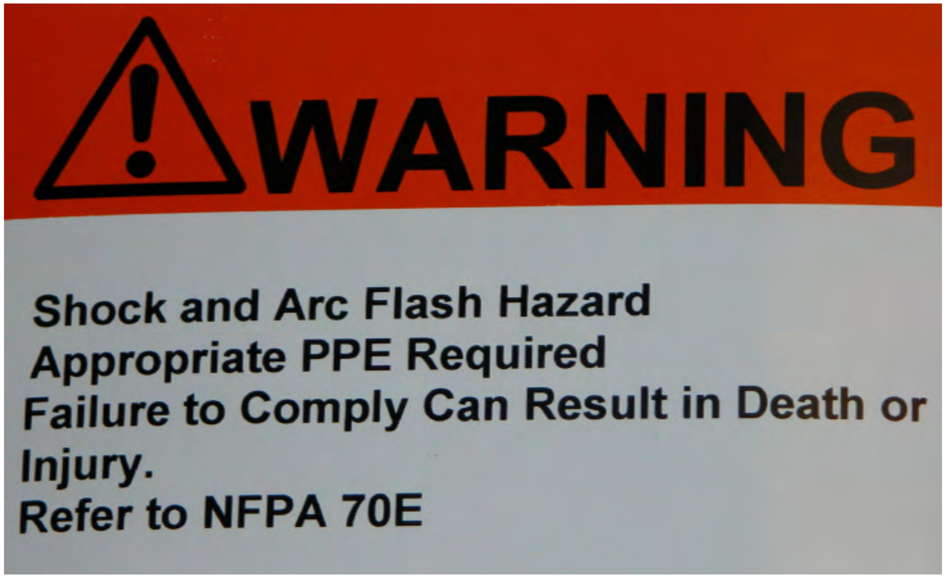
- Purpose – provide safety requirements for electrical workers
- Lead agency – Navy
  - Point of contact – John Peltz
- Current status – draft

Contacts

- Navy – John Peltz
- Air Force – Dr. Daryl Hammond
- Army – Robert Billmyre

Significant Changes

- Energized work addressed in detail
- Personal protective equipment (PPE) requirements clarified
- Arc flash protection included



Arcing Fault Events

- An arc is produced by flow of electrical current through ionized air after an initial flashover or short circuit
- Arcs produce some of the highest temperatures known to occur on earth – up to 35,000 deg F. This is four times the surface temperature of the sun
- All known materials are vaporized at this temperature


4

Arc Flash Effects

- Average of 1710 *(reported)* electrical burns per year in USA
  - Burn from intense heat
  - Trauma from blast pressure
  - Toxic gases from vaporized metal
  - Sprayed molten metal droplets
  - Hearing damage from sound pressure wave
  - Eye damage

Unified Facilities Criteria (UFC) 3-560-02, Electrical Safety

Basis for Requirements

Electrical Safety Requirements – OSHA CFR Title 29

- Part 1910 Occupational Safety and Health Standard, Subpart S – Electrical
  - Design Safety Standards and Safety Related Work Practices
- Part 1926 Safety and Health Regulations for Construction, Subpart K – Electrical
  - Installation Safety Requirements, Safety Related Work Practices, Safety Related Maintenance Practices

Electrical Safety Requirements – OSHA CFR Title 29

- Part 1910 is for general industry
- Part 1926 is for the construction industry
- OSHA standards tend to provide general requirements and often do not provide specific details

OSHA’s General Duty Clause

- “each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious harm to employees.”

NFPA 70E-2004

- *Standard for Electrical Safety in the Workplace*
- Provides the specific guidance not provided in OSHA documents
- Was developed to assist OSHA in the area of electrical safety
- Uses same or similar wording as OSHA and NFPA 70, *National Electrical Code* (NEC) in several sections

Energized Line Work

- NFPA 70E, Article 130.1:
  - "Live parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee works on or near them, unless the employer can demonstrate that deenergizing introduces additional or increased hazards, or is infeasible due to equipment design or operational limitations."

NFPA 70E-2004

- Significant changes and reorganized
- Arc flash and PPE requirements addressed in detail
- References IEEE 1584, *IEEE Guide for Performing Arc-Flash Hazard Calculations*

Unified Facilities Criteria (UFC) 3-560-02, Electrical Safety

New or Expanded Requirements

UFC 3-560-02 – Major Changes

- Clearly adopts NFPA 70E as a basis for electrical safety
- Expands requirements related with working on energized electrical equipment
- Addresses PPE requirements for protection from the burn effects of arcing faults

Energized Work Permit

- Description of work and location
- Justification for why the work must be performed in an energized condition
- Description of work practices to be followed
- An electrical shock analysis and boundaries (safe working distance)

Energized Work Permit

- Arc flash hazard analysis and flash boundary determination
- Necessary PPE to safely perform the task
- Means to restrict access of unqualified persons in work area
- Evidence of completing the job briefing, i.e. safety, tools, PPE, any other hazards

Personal Protective Equipment

- PPE requirements will include:
  - FR shirt and pants (or FR coveralls) with minimum arc rating of 8 cal/cm^2
  - Safety glasses (no metal frames) with side shields
  - Leather electrical hazard-rated (EH) work shoes
  - Leather gloves
  - Voltage-rated gloves with leather protectors

Personal Protective Equipment

- PPE requirements will include:
  - Arc flash hood in combination with a face shield rated for a minimum of 8 cal/cm2 attached to a hard hat, or an arc flash protective hood rated for a minimum of 8 cal/cm2
  - Hearing protection as required in accordance with local procedures

Flame Resistant (FR) Clothing

Hazard/Risk Category	General Clothing Description	Required Minimum PPE Arc Rating (cal/cm^2)
0	Non-melting, flammable materials	N/A
1	Flame-resistant (FR) shirt and FR pants, or FR coverall over Category 0 clothing	4
2	Category 1 clothing, including cotton underwear (conventional short sleeve t-shirt and brief/shorts)	8
3	Category 2 clothing with an extra set of coveralls (FR shirt and pants with cotton underwear plus FR coverall, or cotton underwear plus two FR coveralls)	25
4	FR shirt and pants with cotton underwear plus multilayer flash suit	40

Arc Flash Hood

Arc Flash Protective Hood

Arc Flash Hazard Analysis

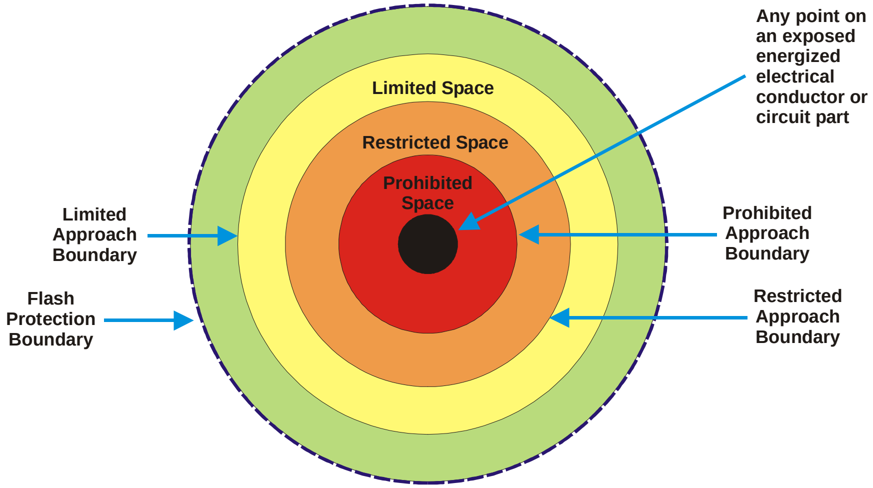
- Determines flash protection boundary and PPE requirements as a function of location and work activity
- Typically requires electrical analysis software to do an effective arc flash hazard analysis
- UFC will provide tables for various tasks if the arc flash hazard analysis tools are not available

Arc Flash Hazard Analysis

- Arc flash hazard and flash protection boundary varies with:
  - Type of equipment and equipment configuration
  - Available short circuit current
  - Voltage
  - Predicted fault duration – protective devices upstream of the arcing fault and their settings

Approach Boundaries

- Limited Approach
- Restricted Approach
- Prohibited Approach



- All of these are based solely on voltage

- Flash protection boundary is different

Typical Arc Flash PPE Criteria

- Operating low voltage breakers with covers on – standard FR clothing
- Working on 480 volt exposed energized parts – FR clothing, arc flash hood, hard hat with face shield, voltage-rated gloves with leather protectors
- Racking switchgear in and out – above gear plus FR coveralls

Typical Arc Flash PPE Criteria

- Working between the secondary side of a distribution transformer and the service disconnect – above gear plus FR coveralls
- Work on energized high voltage parts – multilayer flash suit
- Exterior high voltage hot stick work – FR clothing, arc flash hood, hard hat with face shield, voltage-rated gloves with leather protectors

The Infrastructure Conference 2005

Defense Facilities Directorate
Federal Facilities Division
Pentagon Renovation Liaison
Steven M. Carter Sr.

Huntsville Corps of Engineers
Utility Monitoring And Control Systems
Project Engineer
Mitch Duke

PENTAGON
A Building, Institution, and Symbol

- The Building:
  - Conceived mid July 1941
  - Provide office space for War Department
  - World events pointing towards U.S. military involvement
  - Construction funded for 83 million dollars
  - Groundbreaking Ceremony September 11, 1941

PENTAGON
A Building, Institution, and Symbol

- The Building:
  - Site located in Arlington Virginia
    - Previous structures included an old airport, brick factory, pickle factory, race track, and low income housing project known as Hell's Bottom.
  - Architectural Style
    - Stripped Neo-Classical
  - Final Design:
    - Open air court surrounded by 5 concentric pentagonal rings traversed by 10 spoke-like corridors.

PENTAGON
A Building, Institution, and Symbol

- The Building:
  - Construction: 16 Months
  - Reinforced Concrete made from 380,000 tons of sand dredged from the Potomac River.
  - Supported by 41,492 concrete piles.
  - Workers:
    - Over 1,000 Architects
    - 14,000 constructions workers & tradesmen
    - Three shifts- 24 hours per day, 7 days per week

PENTAGON
A Building, Institution, and Symbol

- The Building:
  - 6.8 Million Square Feet (632,000 square meters)of Interior Building
  - 23,000 workers
  - 17.5 Miles (28.2 Kilometers) of Hallways
  - 34 acres (137,000 square meters) of grounds and parking lots.
  - 283 Bathrooms
  - 232,000 florescent lamps
  - +1500 air handlers

PENTAGON
A Building, Institution, and Symbol

- The Building:
  - Stairways 131
    Escalators 19
    Elevators 13
    Fire hose cabinets 672
    Fixtures 4,900
    Drinking fountains 691
    Electric clock outlets 7,000
    Clocks installed 4,200
    Windows 7,754
    Glass area (equals 7.1 acres)(23,746 square meters)

PENTAGON
A Building, Institution, and Symbol

- A Symbol
  - One of the top three recognized buildings in the world.
  - Stands for freedom, defense, and might
  - Stands for our unity with other countries for a common goal of free societies.

PENTAGON
What fuels the Pentagon?

- **In One Year, the people at the Pentagon consume over:**
  - Over 112,000 pounds of McDonald's French Fries.
  - Over 424,000 McDonald's Hamburgers.
  - 120,000 scoops of Baskin Robbins Ice Cream.
  - 130,000 Dunkin Donuts bagels, and 730,000 donuts.
  - 26,000 gallons of soup.

PENTAGON
What fuels the Pentagon?

- **In One Year, the people at the Pentagon consume over:**
  - 52,000 gallons of Starbucks coffee.
  - 110,000 gallons of fountain beverage.
  - 78,000 pounds of collard greens
  - 23,400 pounds of turkey
- **McDonald's serves an average of 550 customers per hour during Lunch.**

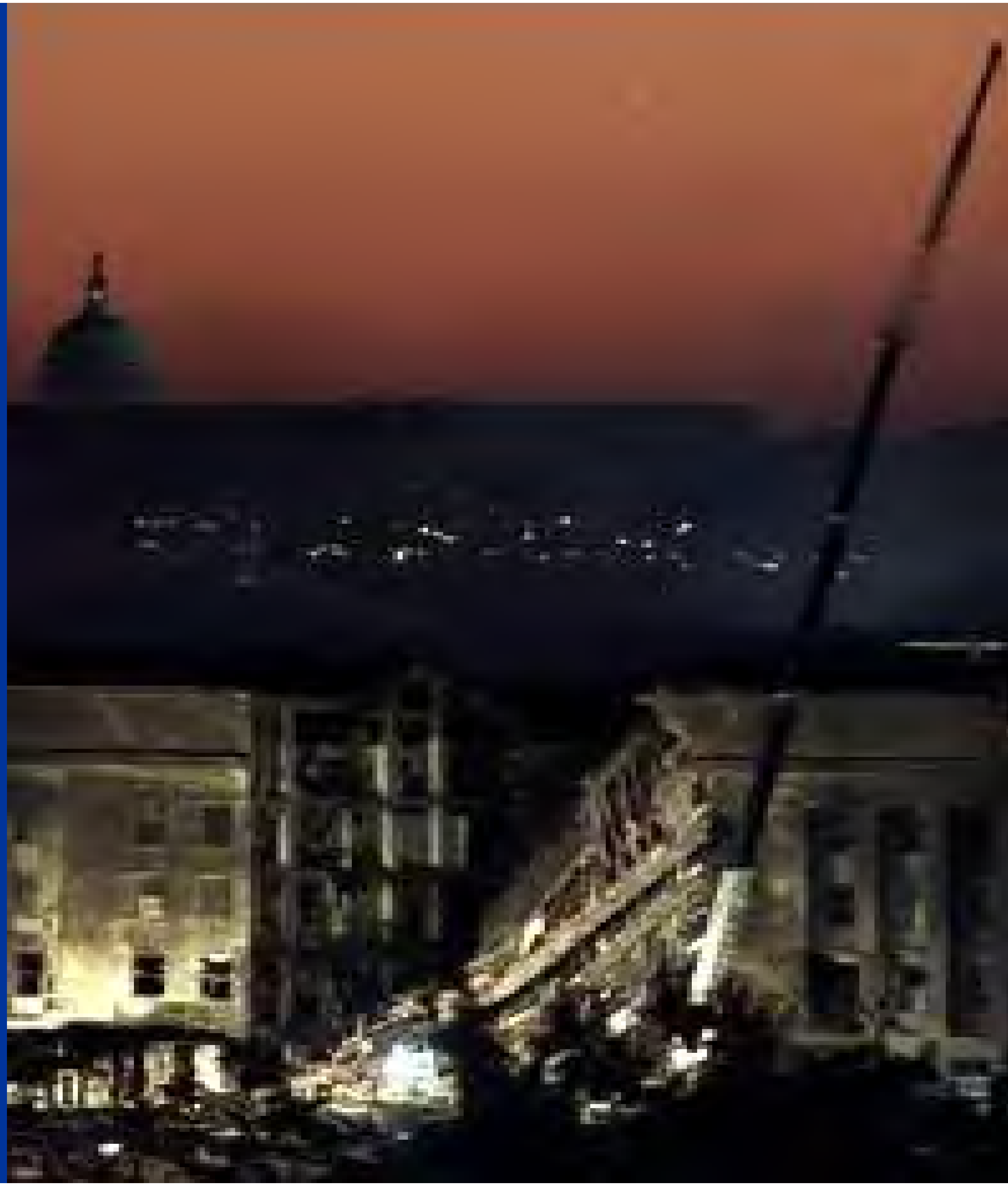
…and then our life and mission changed…..


ANNANDALE
109

104


9 11 2001

View from 395



New Day….New Way

- Teardown and Rebuild Damaged Areas within one year.
- Continue Renovation Program at expedited pace.
- Incorporate Lessons learned.
- Review and adjust requirements.

New Key Phrases

- Terrorist Attacks
- Survivability
- CBRN
- Collective Protection
- Safe Harbor
- Continuity of Operations
- Single Points of Vulnerability
- Multiple Use Systems.

Same Structure….New Vision

- Horizontal Egress
- Collective Protection Systems
- Plan your strategies.
- Practice your plans.
- Codes
- Consistency in design and construction.
- Leverage new technology.

You are NOT alone…..

- Create Partnerships.
  - First Responders.
  - Critical Mission Support
  - Designers
  - Constructors
  - Construction Management Teams
  - Centers of Expertise
- Train with your partners.
- Communicate, communicate, communicate…

The Pentagon Renovation

- The Corps involvement in the Pentagon Renovation.
- What exactly is happening in the Renovation?
- How can it benefit you?

Background

- The Corps of Engineers, Huntsville Alabama- Wedge 1 Award in 1998.
- Competed IDIQ contract for Pentagon in 1998
- Awarded contract for Wedge 1 to Johnson Controls, Inc. in 1998
- Pentagon Renovation Requirements
  - HVAC (Mechanical and Electrical)
  - Computer Room Supplemental Cooling
  - Lighting
  - Energy Management & Control Systems
  - Fire Alarm Systems
  - Access Control
  - Utility Metering and Verification
  - Gas Detection Systems
  - Chemical Biological Radiological Nuclear Response (CBRN)

Pentagon Items of Interest

- Building Operations and Command Center
- National Military Command Center
  - Positive Pressure Scheme
  - Air Wash Entrances
- Energy Monitoring and Command System
- Chemical Biological Radiological Nuclear Response (CBRN)
  - Area Purging Schemes
  - Gatekeeper Door Latches
  - CBRN Sensing and Mitigation Strategies

Upcoming Items of Interest

- Smart Lighting
- Wedge 3-5
- Pentagon Shield Test 2
- Pentagon Athletic Complex
- Pentagon Library and Conference Center (PLC2)

How does this benefit you?

- The Huntsville Corps can provide a one stop shop for all building automation and security needs.
- The Huntsville Corps works with the local Corps Districts for Quality Assurance and Quality Control.
- The Huntsville Corps strives for customer satisfaction at a reasonable fee.

U.S. Army Corps of Engineers

St. Louis District

Festus/Crystal City Levee & Pump Station

Gateway to Excellence

Project Overview

- Project protects the adjacent cities of Festus and Crystal City, MO., including the sewage treatment plant and a major highway connecting the cities.

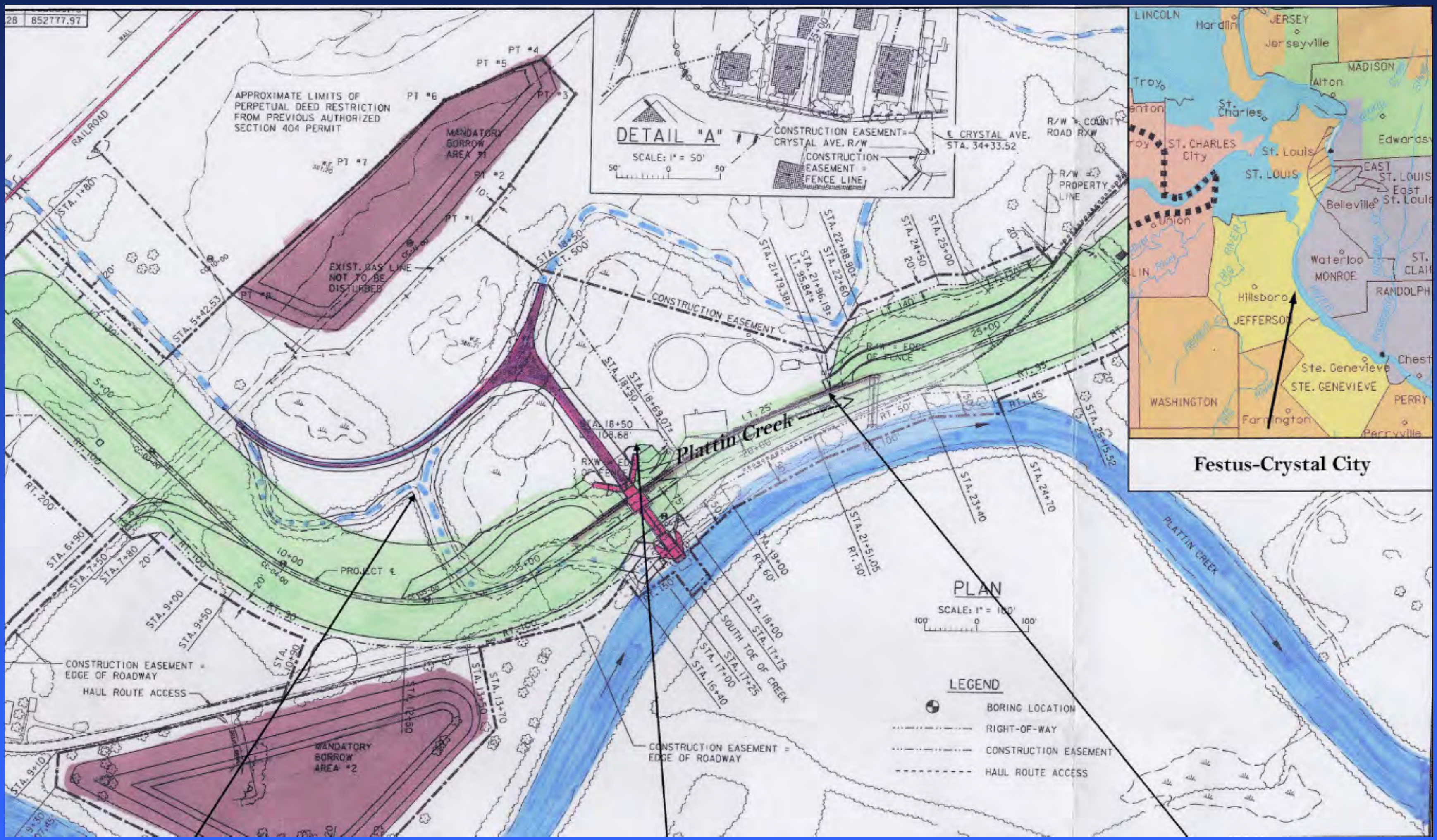
Project Overview

- The project will keep flood events, such as the Great Midwest Flood of 1993, from impacting life in these towns.

Project Overview

- Project provides Urban Design Level of Protection (500 year flood).
- Only highway between Festus and Crystal City subject to flooding.
- Only sewage treatment plant for a growing area with a present population of 40,000.
- Multiple project features were constructed.
- Total Project Cost $13,400,000.

Project Overview



St. Louis District

Gateway to Excellence

Project Overview

EARTHEN LEVEE

St. Louis District

Gateway to Excellence

Project Overview

RAILROAD CLOSURE STRUCTURE

Project Overview

PUMP STATION WITH MSE WALL

St. Louis District

Gateway to Excellence

Project Overview

MECHANICALLY STABILIZED WALL AND EMBANKMENT

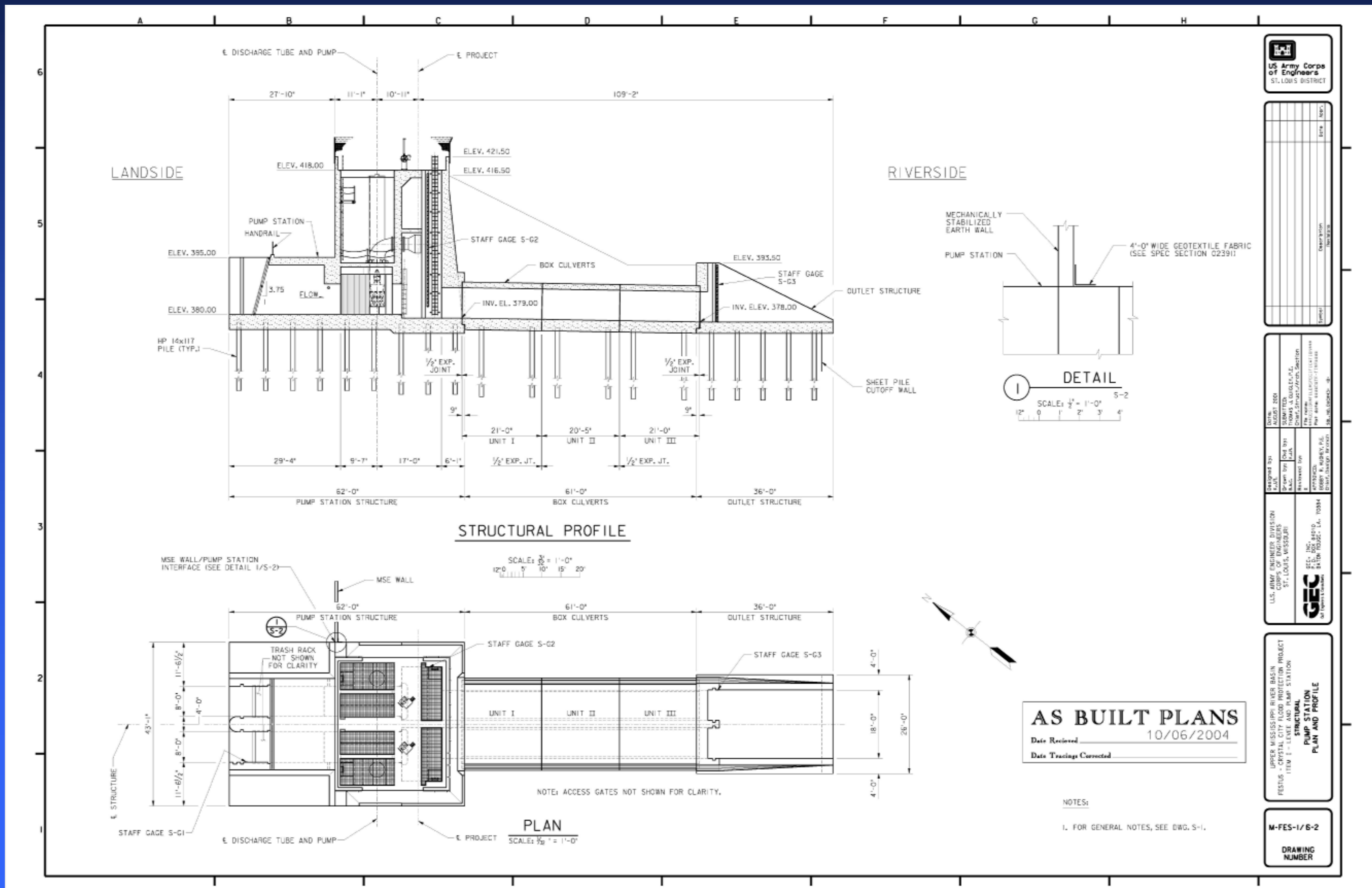
Pump Station Overview

- 120 cfs Total Pump Station Capacity
- 2 - Flygt Submersible Pumps
- 505 acre Ponding Area
- 2 – 8' Wide x 8' High Box Culverts with Cast Iron Sluice Gates
- Pump Station Switchgear and Controls Located Inside the Existing Sewage Treatment Plant
- Station Operates at 480 VAC
- Automatic Sluice Gate and Pump Operation Using Programmable Logic Controller
- Total Pump Station Construction Cost - $3,000,000

St. Louis District

Gateway to Excellence

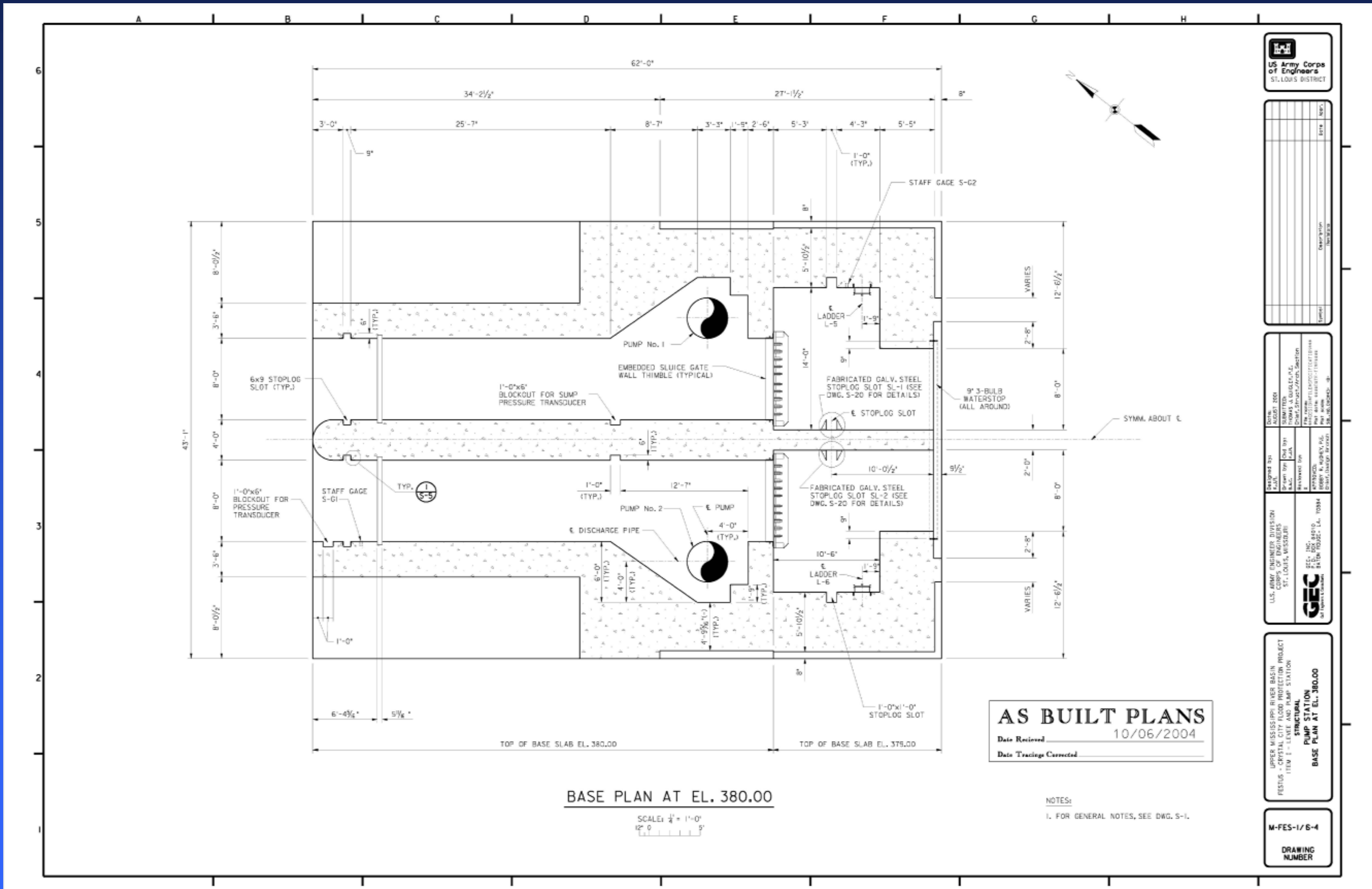
Pump Station Plan & Profile



St. Louis District

Gateway to Excellence

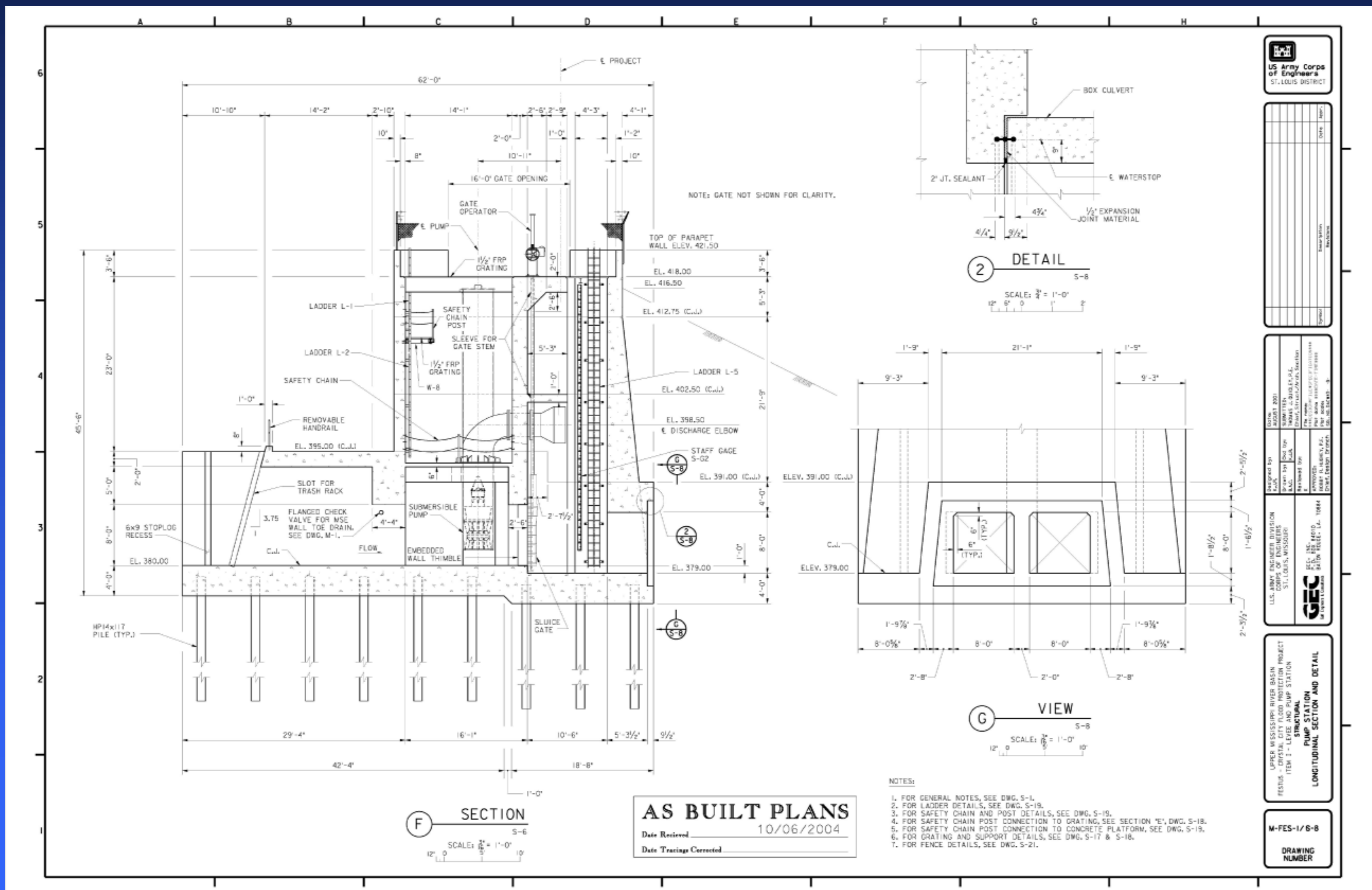
Pump Station Sump Plan



St. Louis District

Gateway to Excellence

Pump Station Profile



St. Louis District

Gateway to Excellence

Pump Station/Gravity Drain

INLET STRUCTURE

St. Louis District

Gateway to Excellence

Pump Station/Gravity Drain

OUTLET STRUCTURE

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Pump Station/Gravity Drain

BOX CULVERT CONSTRUCTION

St. Louis District

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Pump Station Construction

PUMP STATION STRUCTURE AND WING WALLS

Gateway to Excellence

Gravity Drain Features

SLUICE GATE WALL THIMBLE & GATE SLIDE

Gravity Drain Box Culvert

SLUICE GATE SLIDE & GATE HOIST

St. Louis District

Gateway to Excellence

MSE Wall Installation

MSE WALL FOUNDATION & EMBANKMENT

MSE Wall Installation

MSE EMBANKMENT & BLOCK WALL

Submersible Pumps

- Flygt PL-7081
- Rated for 27,000 gpm @ 13.7 ft. TDH
- Pump Speed – 885 RPM
- Pump Tube Diameter – 40 in.
- Motor Size - 200 Hp
- Motor Voltage - 480 V
- Rated Current - 242 amp

St. Louis District

Gateway to Excellence

Submersible Pumps

FACTORY TESTING IN SWEDEN

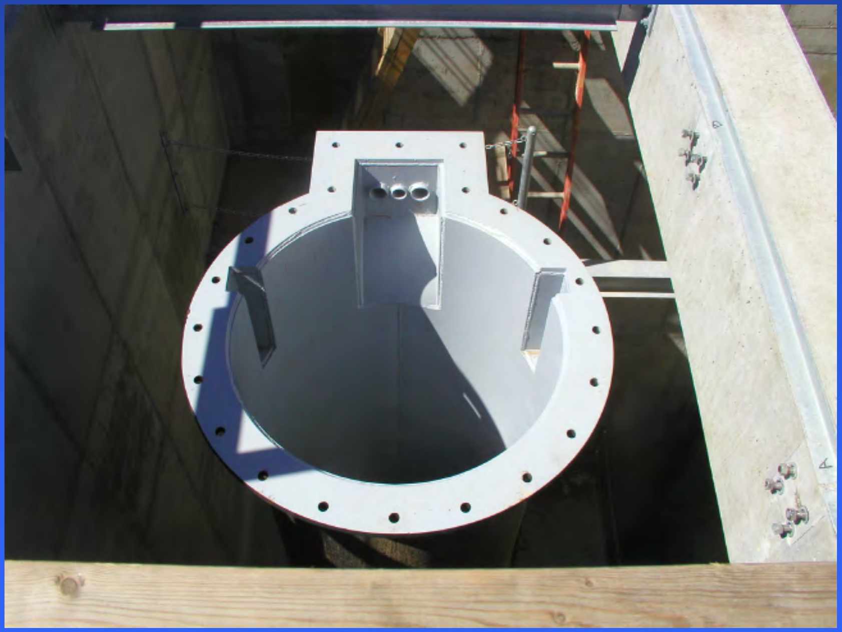
Submersible Pumps

PUMP DISCHARGE TUBE

St. Louis District

Gateway to Excellence

Submersible Pumps



PUMP DISCHARGE TUBE

St. Louis District

Gateway to Excellence

Submersible Pumps

"DUCK-BILL" DISCHARGE INSTEAD OF FLAP GATE

Submersible Pumps

PUMP INSTALLATION

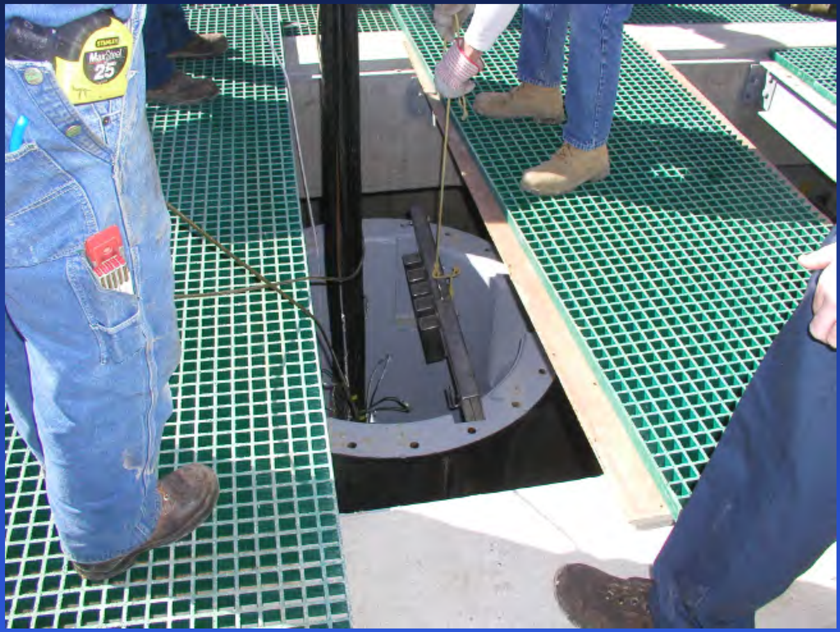
St. Louis District

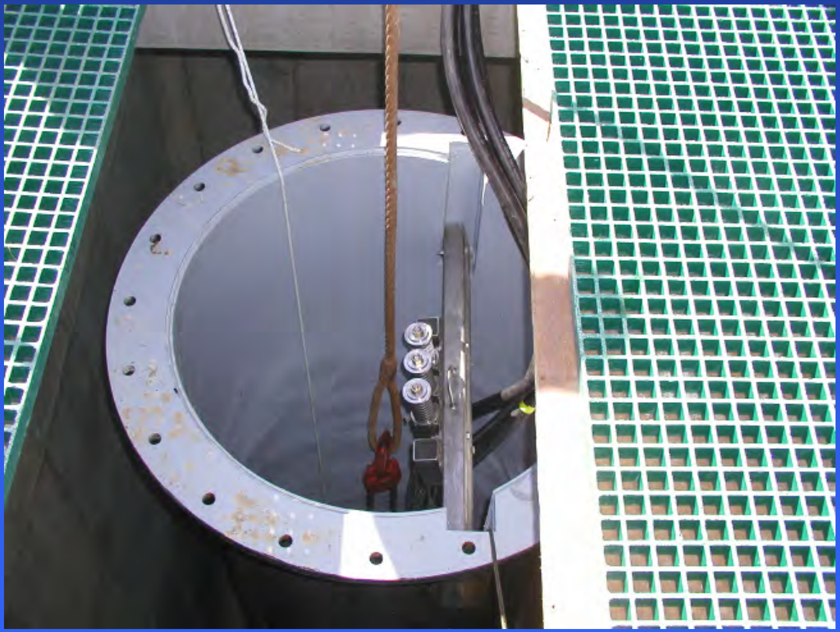
Gateway to Excellence

Submersible Pumps

SUBMERSIBLE PUMP INSTALLATION

Submersible Pumps





"GRIP-EYE" SYSTEM TO SUPPORT POWER CABLES

Submersible Pumps

SIDE POWER CABLE ENTRANCE INSTEAD OF THRU THE TOP OF THE TUBE

St. Louis District

Gateway to Excellence

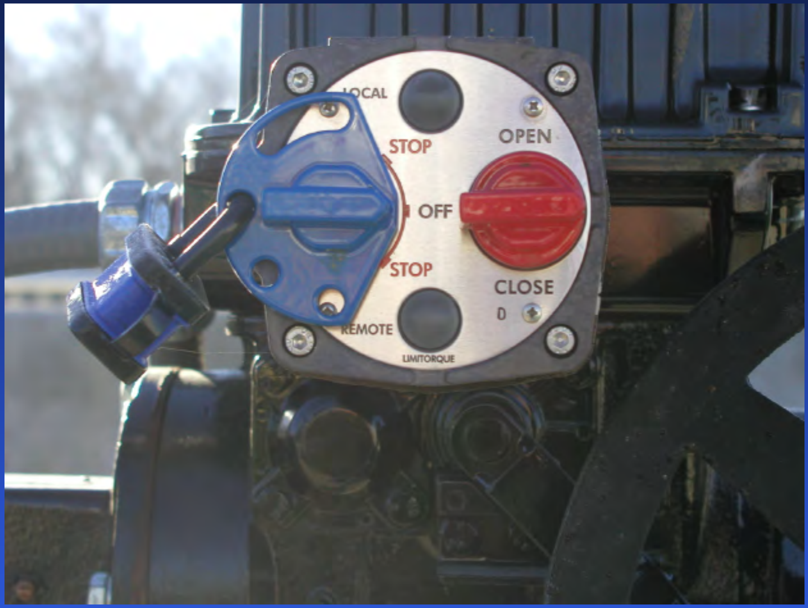
Electrical Controls

ELECTRICAL
EQUIPMENT
INSTALLATION

Automatic Operation

- PLC automatically operates two gravity flow sluice gates at programmed water levels (using motor actuated gate hoists).
- Pressure transducers measure water level in four locations: Inlet, Outlet, Sump No. 1 and Sump No. 2.
- Two transducers are installed at each location to monitor for accuracy of measurements. PLC Logic detects open circuit or out of range.
- PLC starts and stops the pumps based on the water level at the Inlet Structure.
- PLC stores the run time of each pump in memory.
- Manual (Hand) Operation for sluice gates and pumps.
- Low Water Cut-off Float for Pumps and Float Operated High Water Sluice Gate Back-up Operation

Monitoring & Control Systems



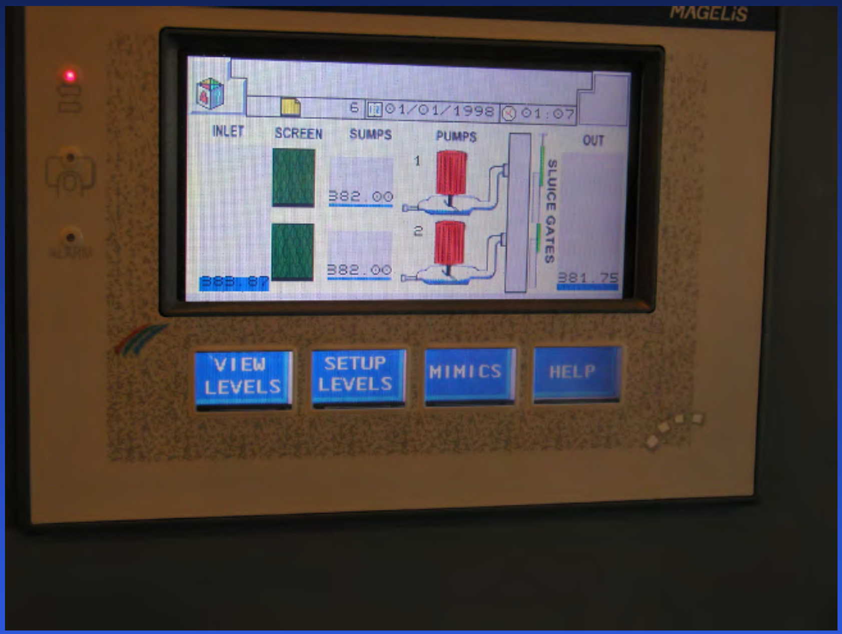
Sluice Gate Controller

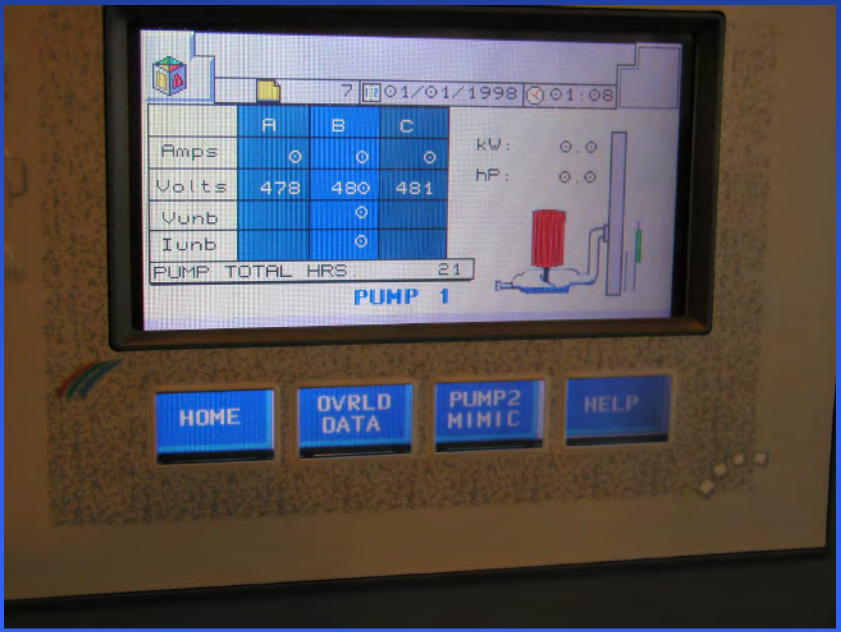
Pump Control Panel

St. Louis District

Gateway to Excellence

Monitoring & Control Systems





Pump & Sluice Gate Status Screen
(MAGELIS Screen)

Monitoring & Control Systems

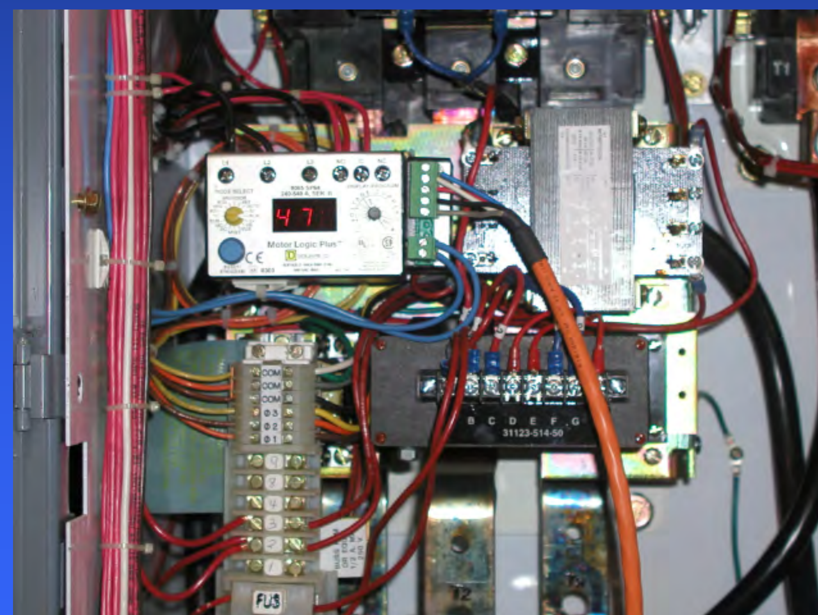
Digital Water Level Display

Sump Transducers

Inlet Transducers

Pump & Motor Protection

Pump/Motor Monitoring Device
(Flygt CAS Unit)



Solid State Overload Relay

Auto Dialer

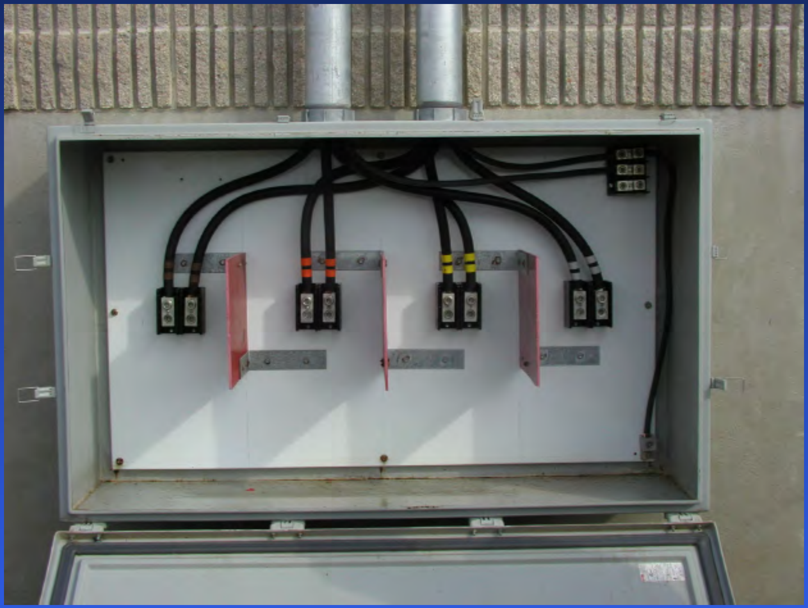

SENSAPHONE
EXPRESS II
MONITORING SYSTEM
Phonetics, Inc.


EXPRESS II
Phonetics, Inc.
937-7444

St. Louis District

Gateway to Excellence

Provisions for Back-Up Generator



Generator Connection Access Panel

Dedicated Circuit Breaker for Generator

Failures and Alarms

- PLC monitors the CAS Unit and Solid State Overload Relay located in the motor starter. The CAS Unit instruments the following:
  - Stator Temperature
  - Bearing Temperature
  - Stator Leakage
  - Motor Junction Box Leakage
- The PLC tries to start a pump for 30 seconds. If the pump does not start, a “Failure to Start” alarm is generated.
- Failures trigger the audible alarm located on the PLC Enclosure to alert an onsite operator.
- PLC also tries to start the second pump.
- If personnel do not acknowledge the alarm within 10 minutes, the PLC activates the autodialer.

Presenter

Stephen G. Farkas, P.E.

Chief, Struc/Arch/Mech/Elec Section

CEMVS-ED-DA 314-331-8264

stephen.g.farkas@mvs02.usace.army.mil

Chicago Underflow Plan
(CUP)

McCook Reservoir

Construction of Distribution Tunnel
and
Pumps Installation

U.S. Army Corps of Engineers©
Chicago District

Metropolitan Chicago's sewer system is comprised of combined sewers that collect both raw sewage and storm-water runoff. The combined sewers transport the mixed flow to water reclamation for treatment. When the capacity of the combine sewers is exceeded during storm events, the combine sewage is diverted to the Mainstream and Des Plaines deep tunnel system. There are also the Upper Des Plaines and Little Calumet Leg Tunnels. The Mainstream tunnel is measured 33 feet in diameter, bored 240 to 330 feet below ground, runs 40.5 miles and can holds more than one billion gallon of water. Currently, untreated Combine Sewage Overflow (CSO) is diverted to the waterway when the capacities of Stickney Water Reclamation Plant (WRP) and the Mainstream and Des Plaines tunnel system exceeded during storm events.

U.S. Army Corps of Engineers©
Chicago District

CUP-McCook Reservoir is to reduce flooding in the Chicago area by serving as a storage facility for excess runoff during storms. The reservoir will hold estimate 22,111acre-feet (10.5 billion gallons) of combined sewage overflows (CSOs) until the Deep Tunnel System can convey the water to the Stickney Water Reclamation Plant (SWRP) prior to discharge to the Chicago Sanitary and Ship Canal.

U.S. Army Corps
of Engineers©
Chicago District

The major components of the project include tunnels, shafts and chambers, rock excavation, inlet structure, inflow/outflow structure, washdown system, aeration system, groundwater protection system, reservoir grading and overburden stabilization, pumps, gates and valves, and site development.

Construction of distribution tunnels and installation of two additional pumps is currently underway and are part of the overall project.

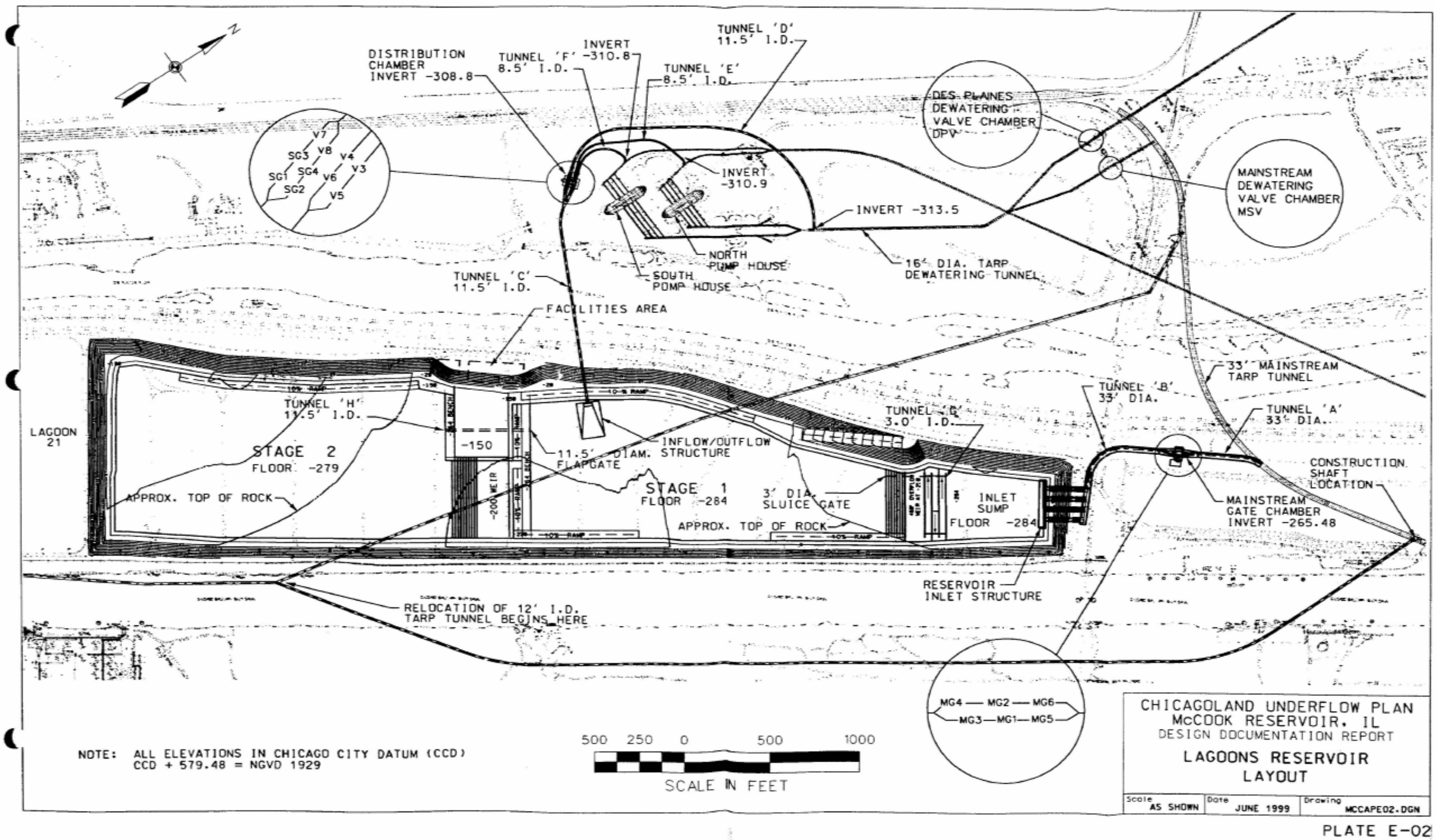
McCook Reservoir includes electrical works for the installation of 2 pumps and its appurtenance equipment at the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) Main Stream Pump Station. The pumps are located at elevation -297' and the 15KV switchgears and control room at elevation +45 feet. Electrical equipment installed includes installation of two 15KV circuit breakers, protective relays, borehole cables, motor control switchboard, fiber optic cables, PLC/SCADA system and etc.

U.S. Army Corps of Engineers©
Chicago District

The new large volute pumps are one low head with capacity of 330 CFS @ 150 feet head, 7,370 horsepower induction motor and high head with capacity of 330 CFS @ 330 feet, 17500 horsepower synchronous motor drive. These pumps are installed in existing underground pump houses together with other existing pumps. The low head pump is installed in the South Pump House and the high head pump in the North Pump House. Installation of pumps involved the survey of station intake and discharge connections, including structural work for pump casing and etc.

U.S. Army Corps of Engineers©
Chicago District

Each motor is operating at 13.2 KV, 3 phases, 60 hertz. The switchgears are located in the switchgear room at +45 feet elevation and the pump motor at –297 feet elevation. Borehole type of power and control cables have to be rigidly supported at the top due to more than 300 feet drops.



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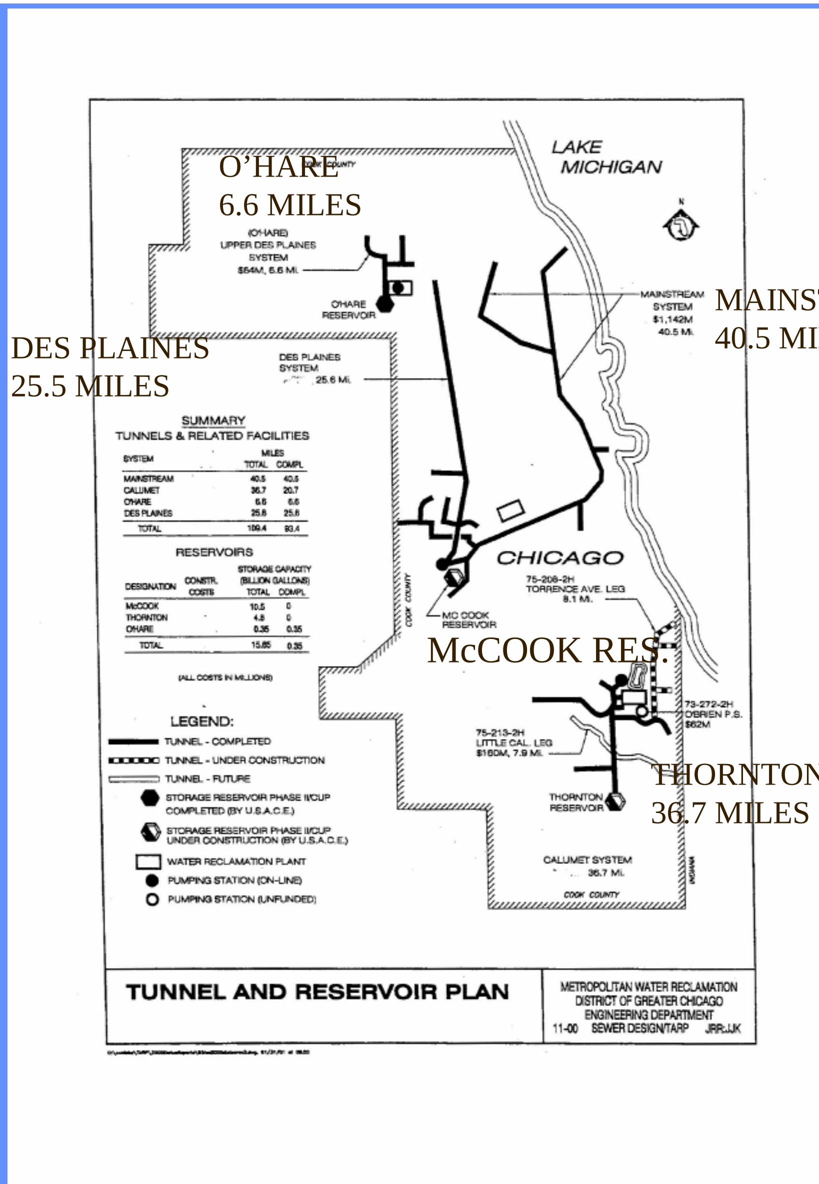
of Engineers©
Chicago District



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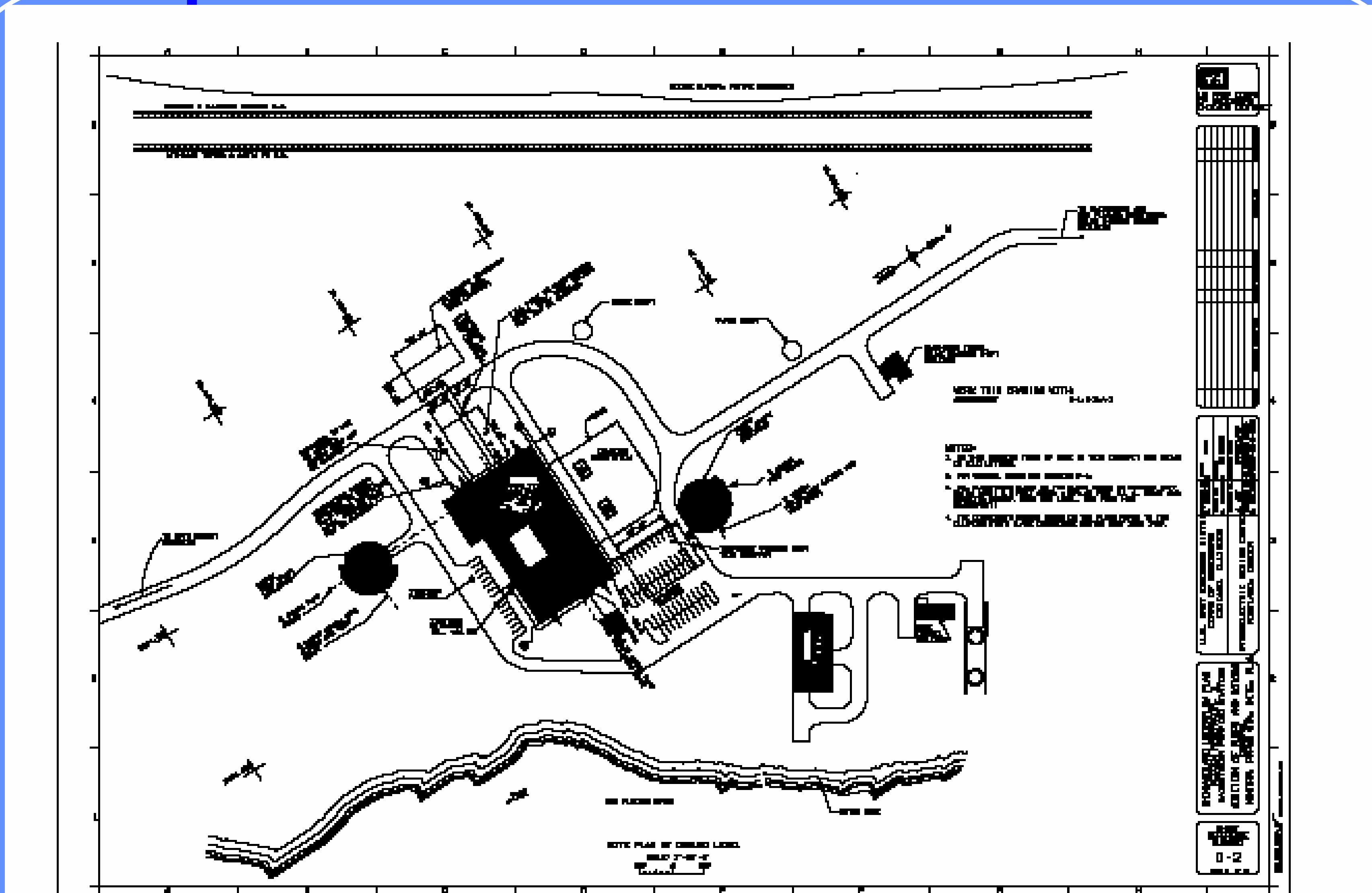

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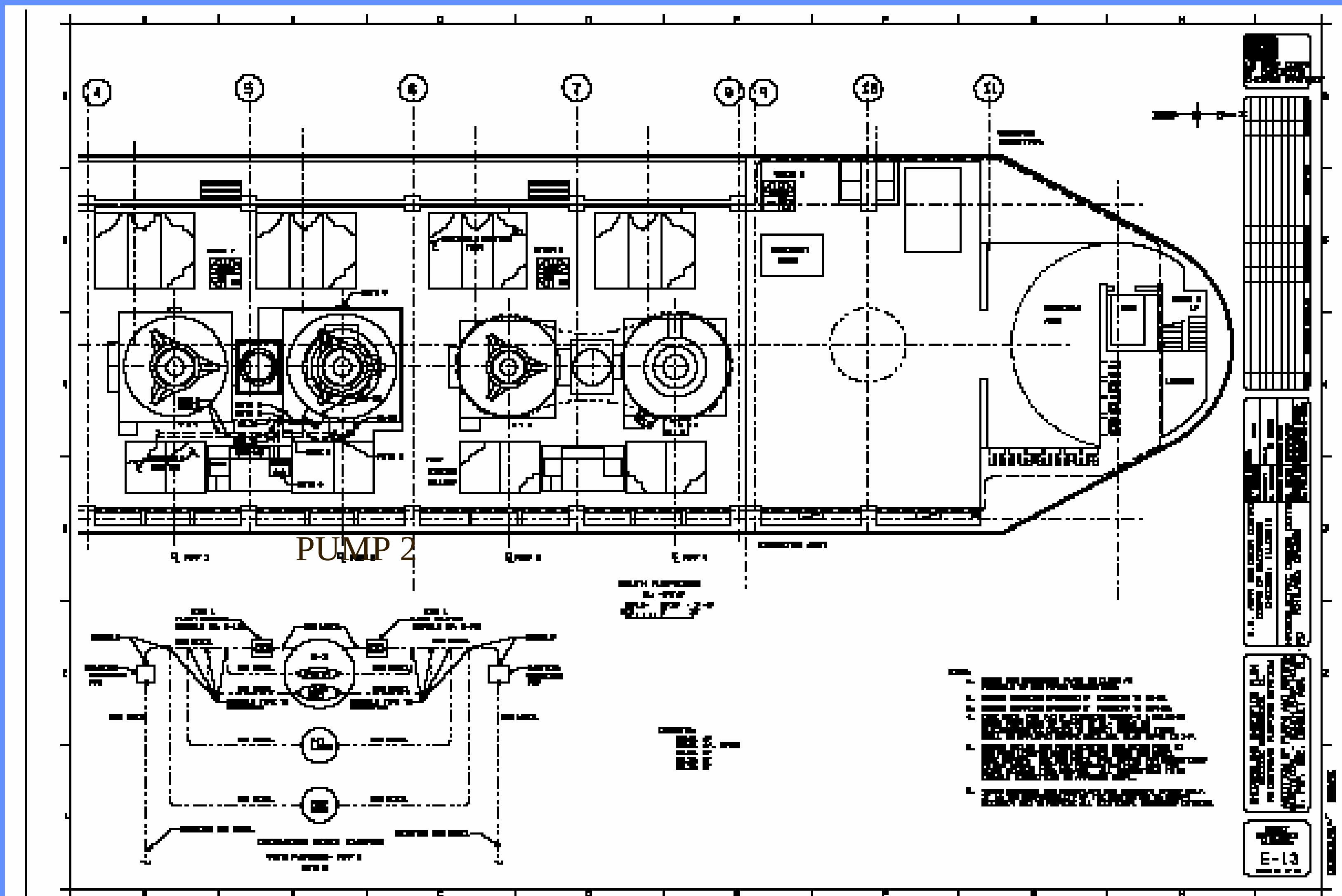
Chicago District

MAIN STREAM PUMP STATION SITE PLAN



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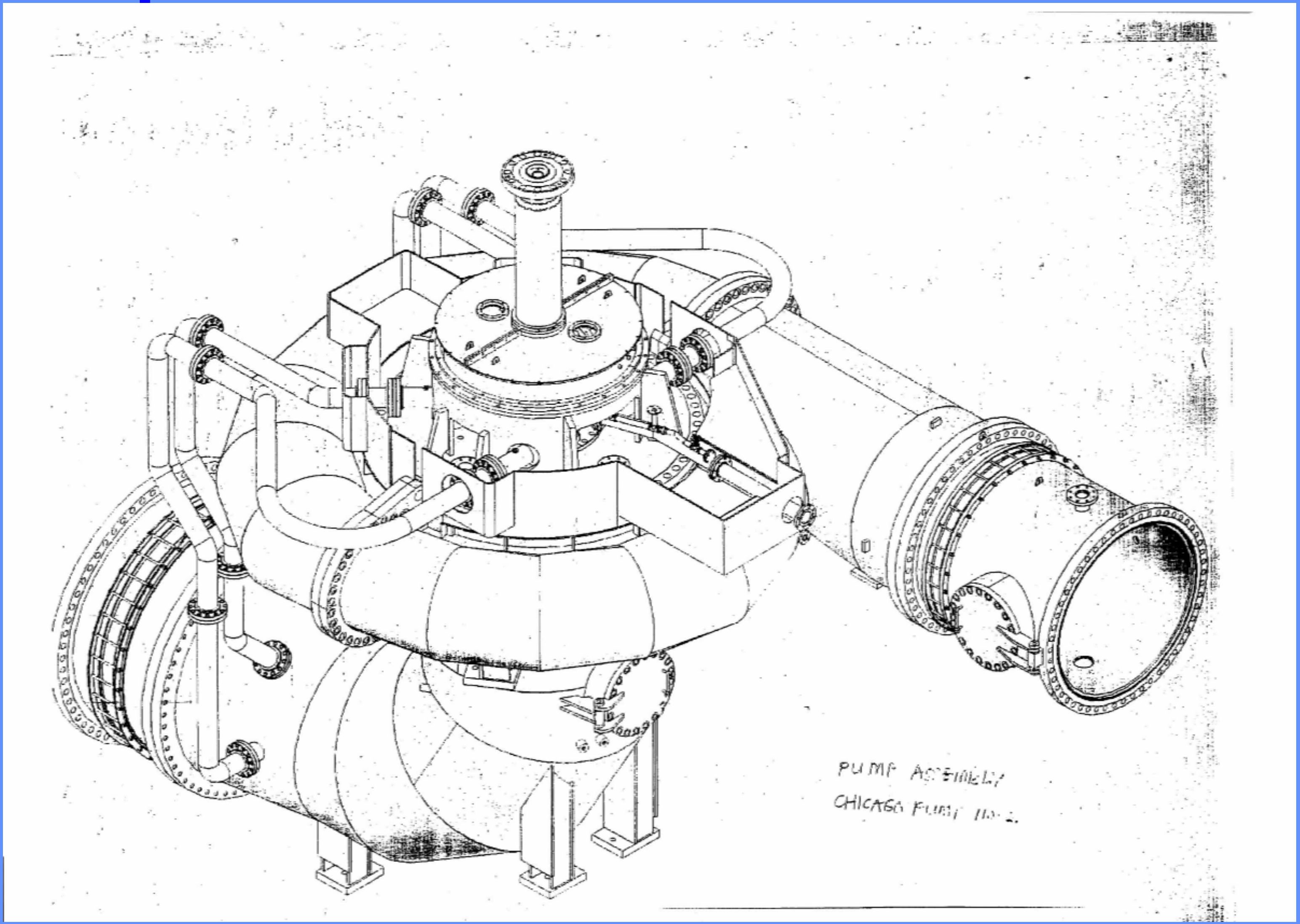
Chicago District

SOUTH PUMP HOUSE AT ELEVATION -297



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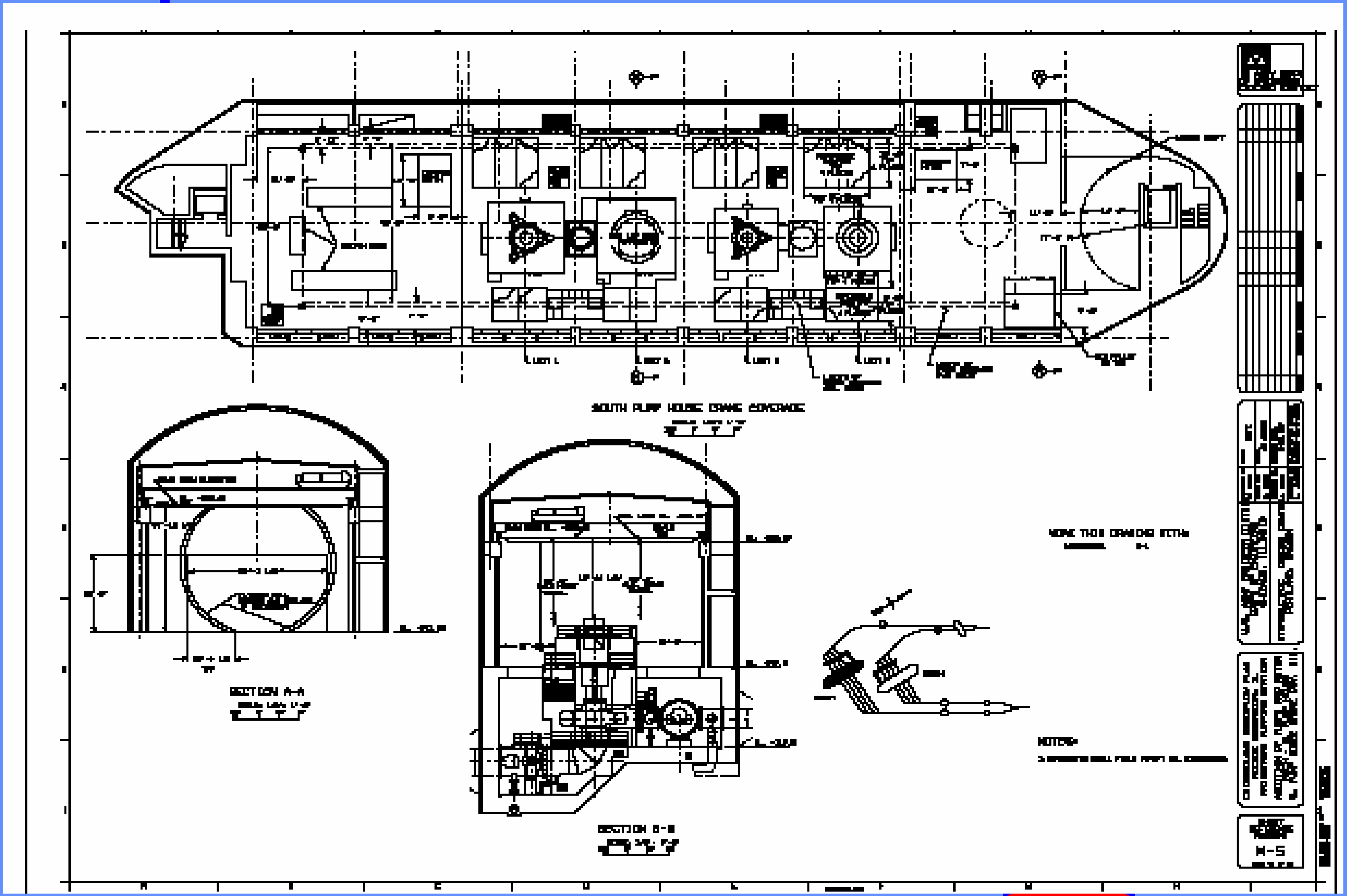
Chicago District

PUMP ASSEMBLY



SOUTH PUMP HOUSE CRANE COVERAGE

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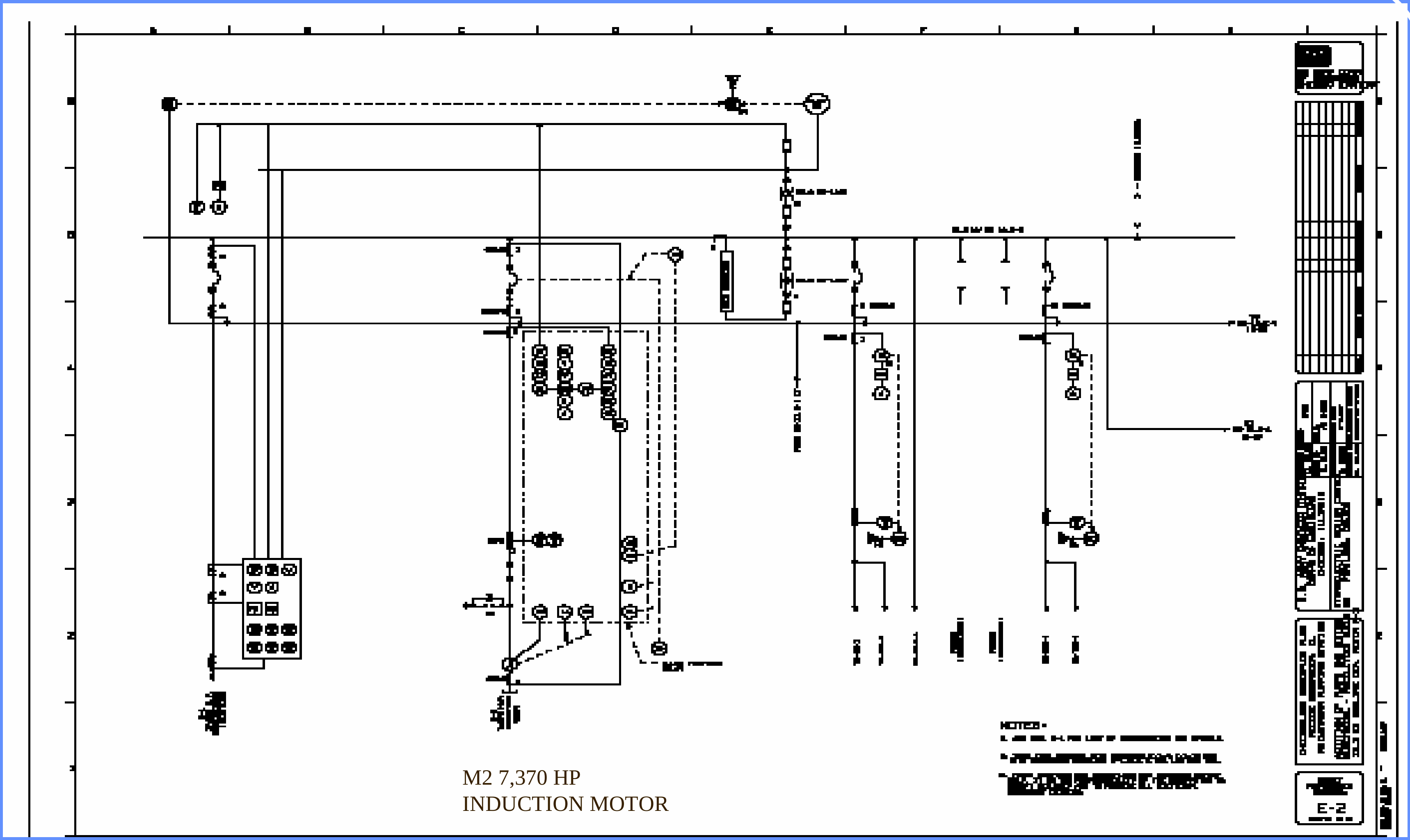
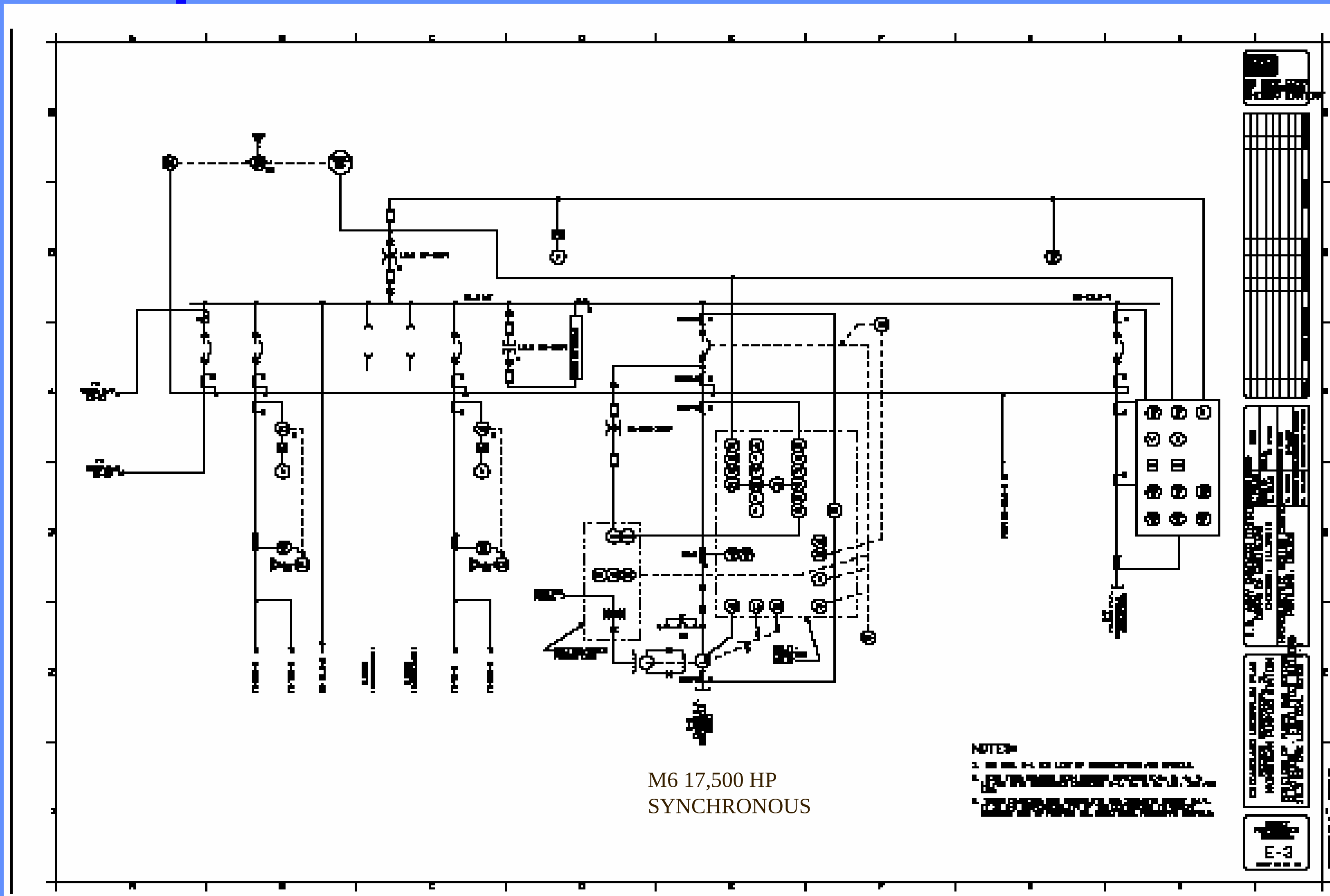
of Engineers©
Chicago District



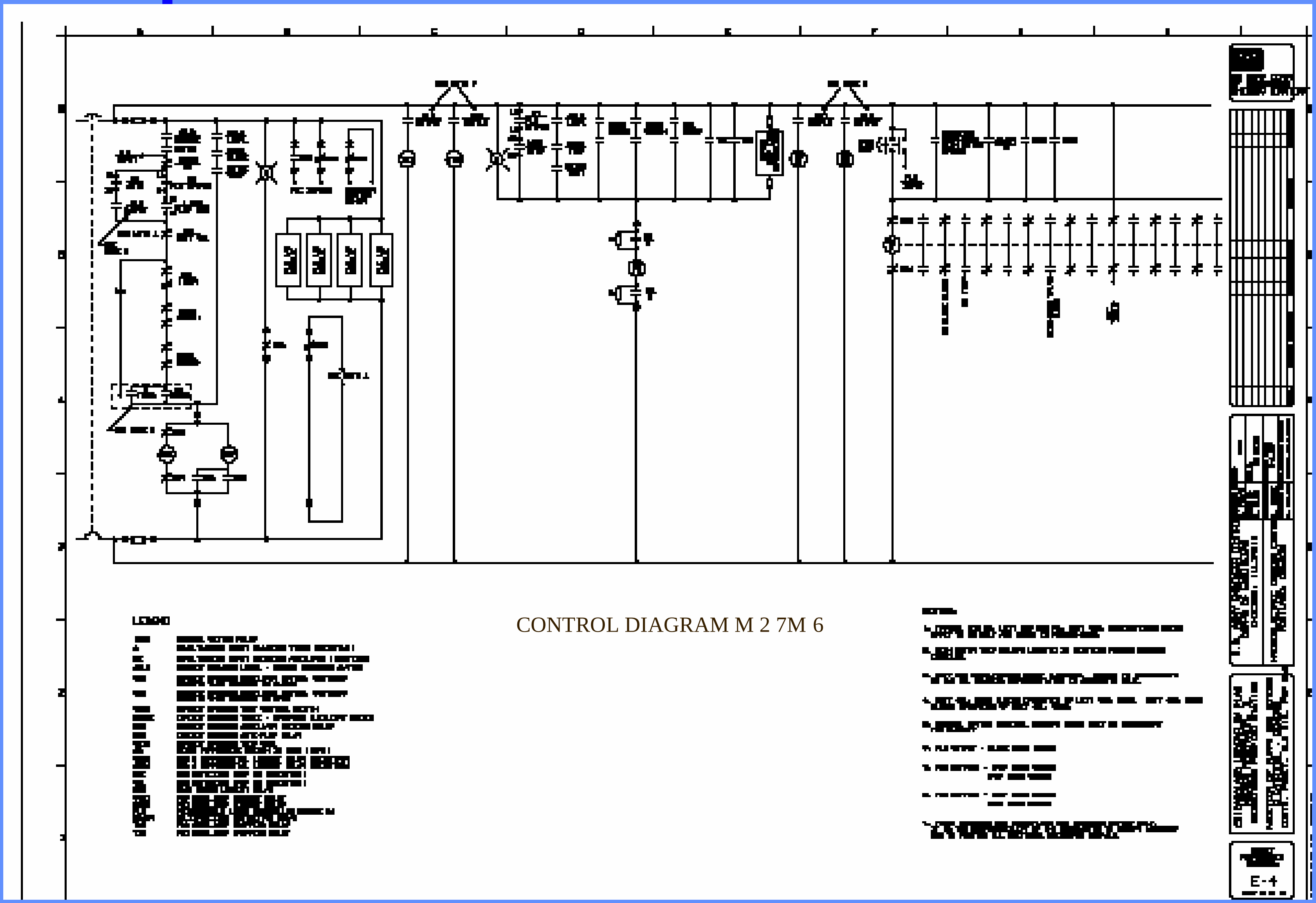
M2 7,370 HP
INDUCTION MOTOR

U.S. Army Corps of Engineers©
Chicago District



M6 17,500 HP
SYNCHRONOUS

U.S. Army Corps of Engineers©
Chicago District



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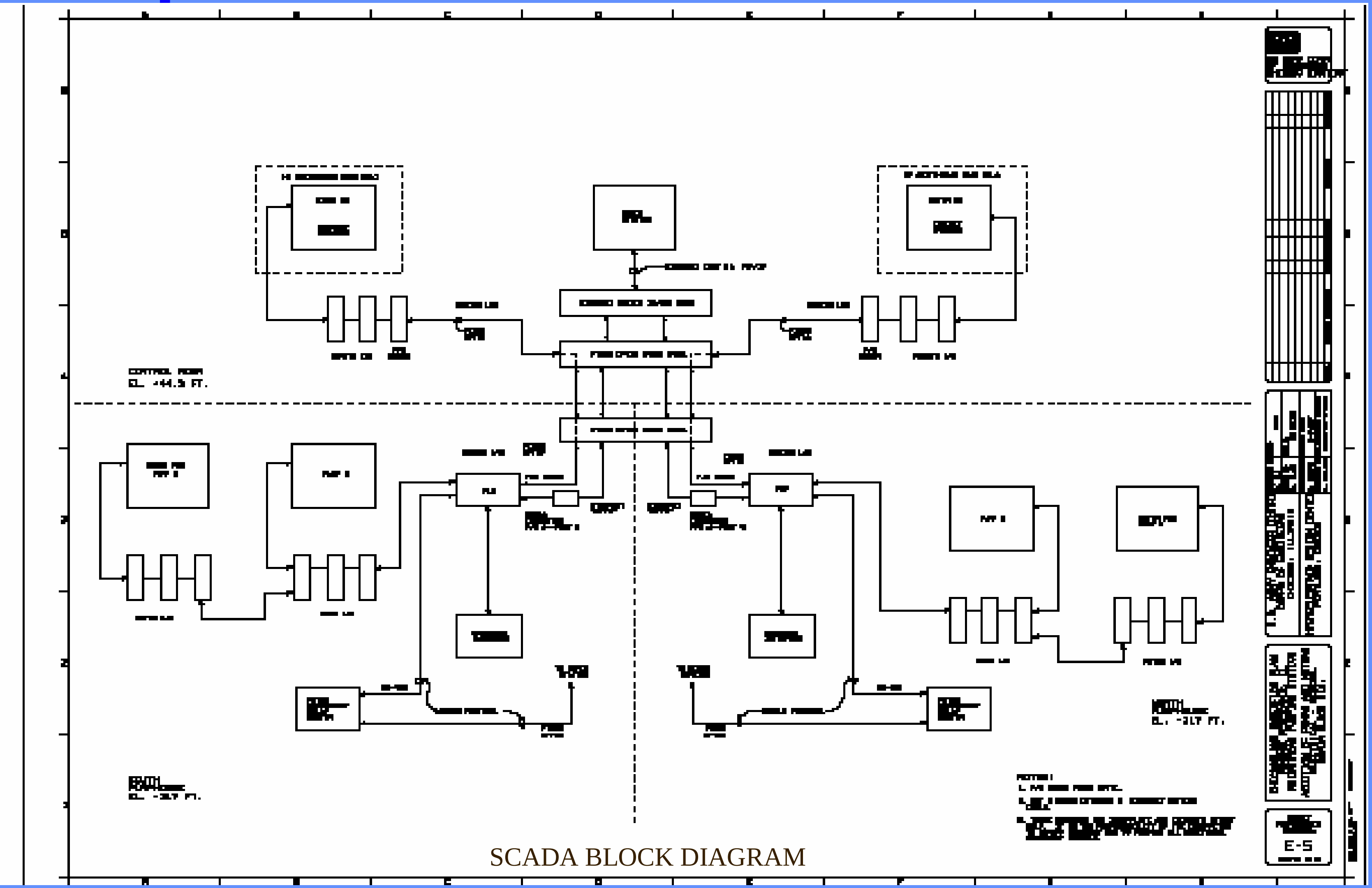


SCADA BLOCK DIAGRAM

U.S. Army Corps
of Engineers©
Chicago District

tart Permissive:

he new pumps 2 and 6 motor circuit breaker shall be interlocked with all of the following conditions exist:

. The pump discharge valve in closed position.

. The pump discharge valve ready.

. The pump suction valve in open position.

. The pump guard valve in open position.

. The discharge tunnel valve in open position.

. Pump suction pressure is above preset value.

. Differential pressure for pump shaft seal water flow is above/below preset value.

. Quantity of bearing cooling water flow is above/below preset value.

. Ventilation running.

0. Motor oil pressure is above preset value. The motor oil pressure not low.

PERMISSIVE

Trips

Motor circuit breaker will be tripped when ever any of the following condition exist.:

1. The head-cover vibration remains very high for a period of time.
2. The pump guide bearing vibration remains very high for a period of time.
3. The pump guide bearing oil temperature is very high.
4. The pump casing temperature is very high.
5. The pump guide bearing metal temperature is very high.
6. Pump suction pressure is below preset value.
7. The ventilation system tripped.
8. The motor thrust bearing metal shoe temperature is very high.
9. The motor upper guide bearing temperature is very high.
10. The motor lower guide bearing temperature is very high.
11. The motor speed remained below 5% for a period of time during start.
12. The motor speed remained below 50% for a period of time when the motor is starting.
13. The motor speed remained below 98% for a period of time when the motor is running.
14. The motor stator winding temperature is very high.
15. The exciter field over current.
16. The exciter loss of field.
17. The exciter loss of control circuit output voltage.
18. The pump discharge valve trouble.

Alarm Indications:

1. Pump guide bearing oil temperature indication and high temperature alarm.
2. Pump shaft seal housing temperature indication and high temperature alarm.
3. The pump seal and guide bearing cooling water low flow alarm.
4. The head-cover high vibration 1 alarm.
5. The head-cover high vibration 2 alarm.
6. The pump guide bearing high vibration 1 alarm.
7. The pump guide bearing high vibration 2 alarm.
8. Pump guide bearing metal 2 temperature indication.
9. Pump guide bearing oil temperature high alarm.
10. Pump guide bearing oil temperature leakage alarm.
11. Pump casing temperature high alarm.
12. Pump casing temperature leakage alarm.
13. Pump guide bearing metal temperature high alarm.
14. Pump guide bearing metal temperature leakage alarm.
15. Thrust bearing shoe 3 temperature indication.
16. Thrust bearing shoe 7 temperature indication.
17. Thrust bearing oil reservoir 2 temperature indication.
18. Upper guide bearing 2 temperature indication.
19. Lower guide bearing 2 temperature indication.
20. Lower guide bearing oil reservoir 2 temperature indication.

CONSTRUCTION OF DISTRIBUTION TUNNEL 300’ BELOW

U.S. Army Corps of Engineers©
Chicago District

Distribution Tunnel Weld

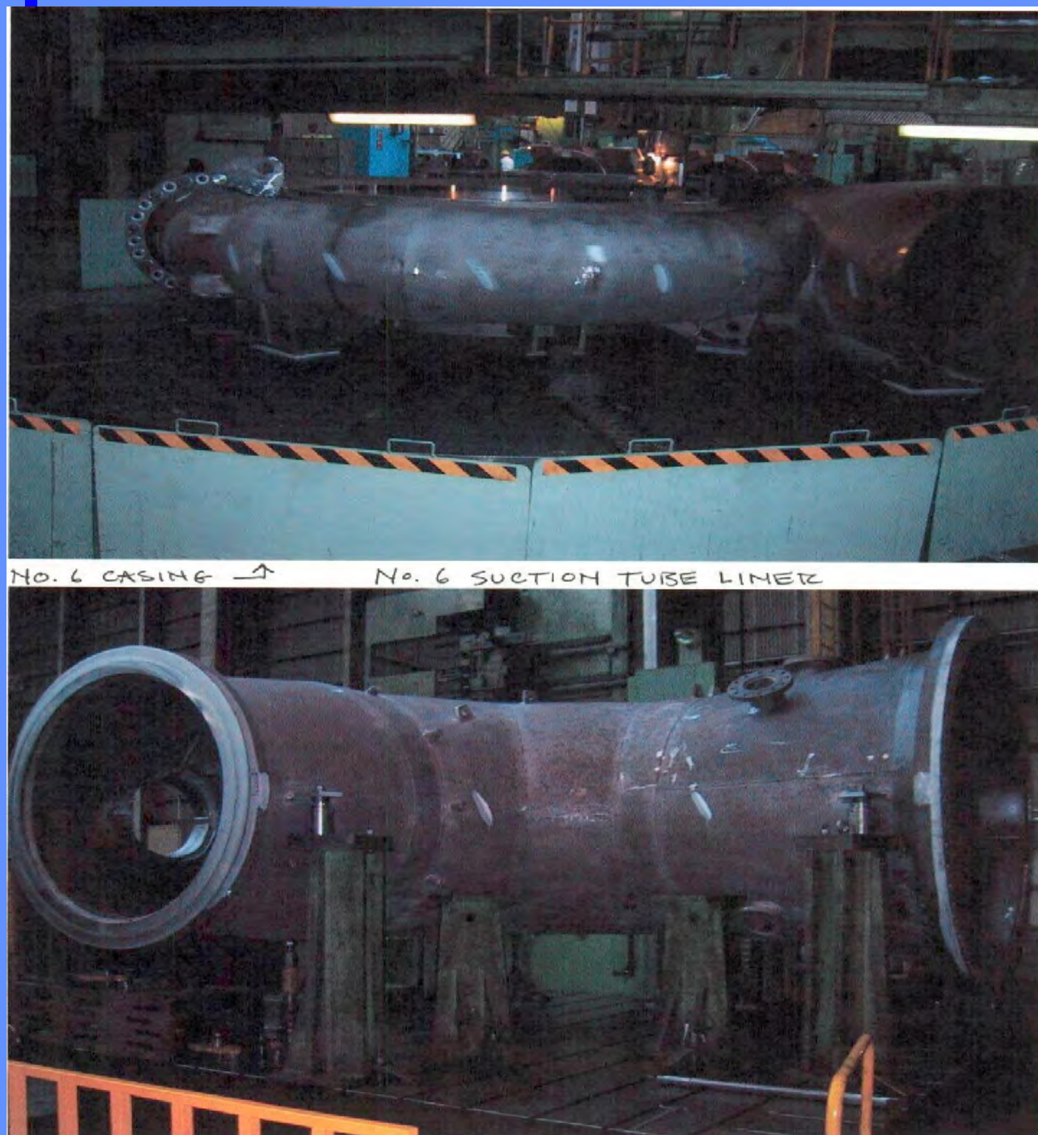
U.S. Army Corps of Engineers©
Chicago District

Transporting the Pump

U.S. Army Corps of Engineers©
Chicago District

Before pump installltion at –317’ elevation

U.S. Army Corps of Engineers©
Chicago District



No. 6 CASING ↑ No. 6 SUCTION TUBE LINER

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Pump Propeller is ready to be dropped from +45’ to the pumphouse at –297’ below.

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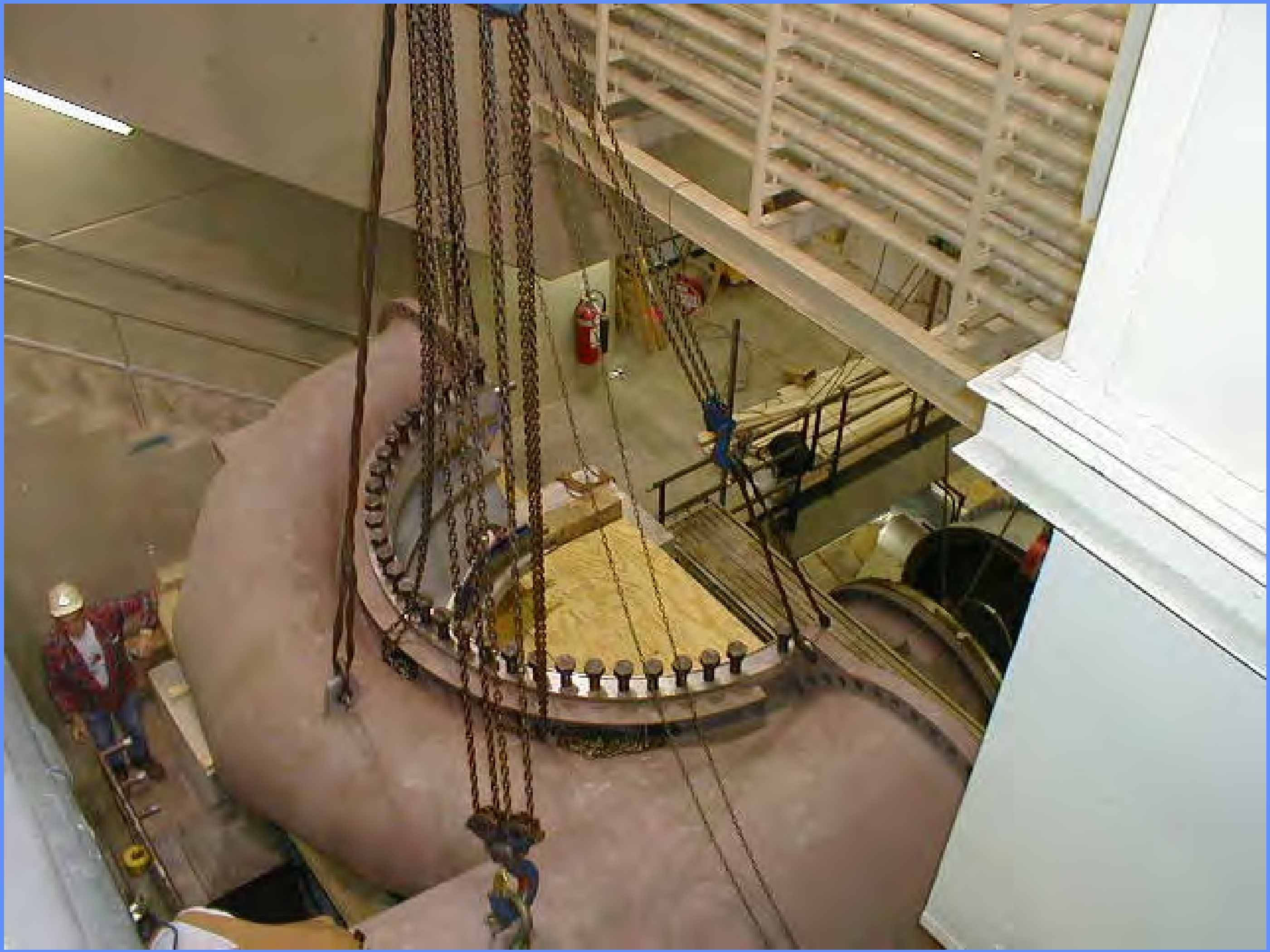
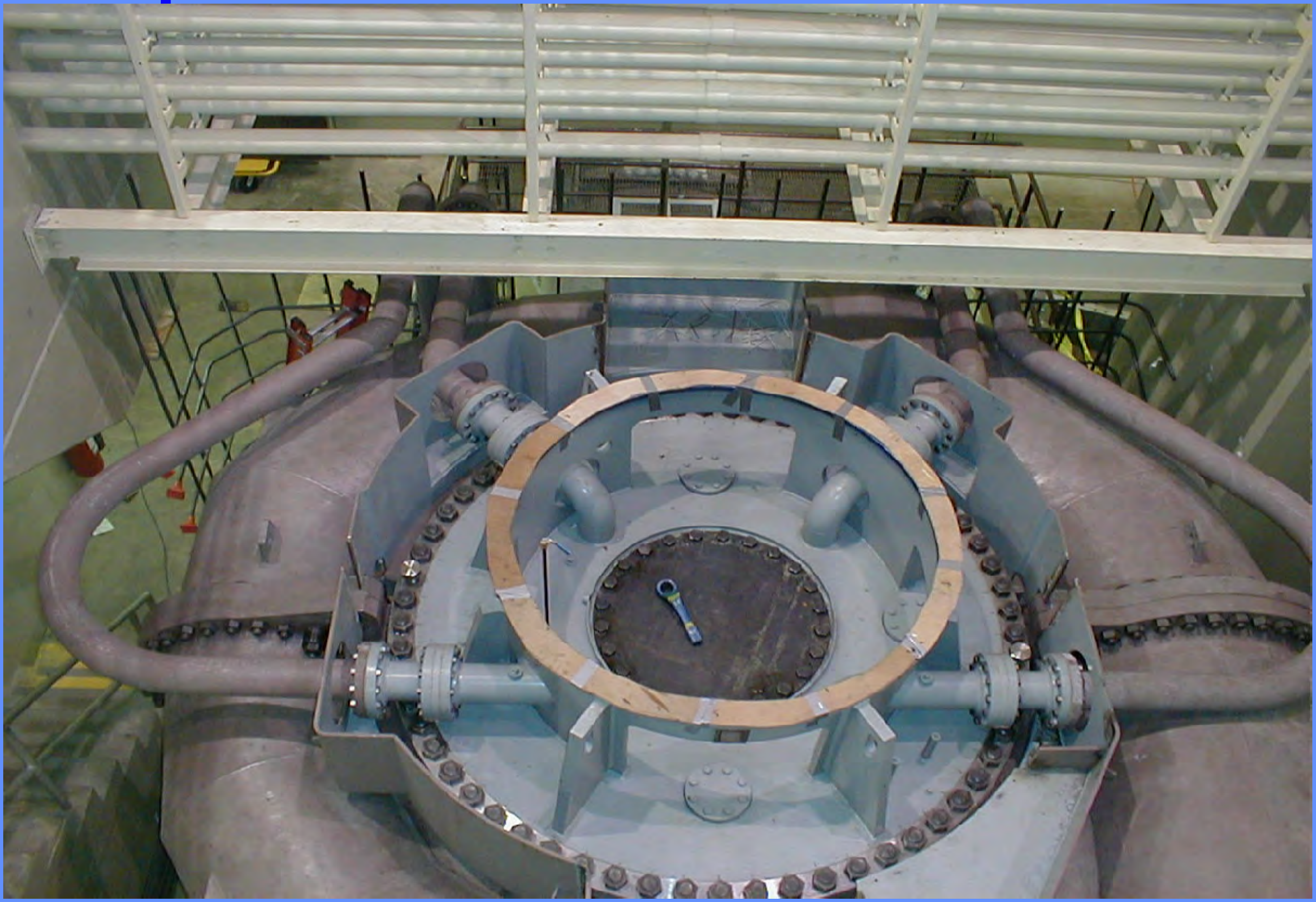


U.S. Army Corps
of Engineers©
Chicago District



PUMP CASING AND PIT LINER INSTALLED

U.S. Army Corps of Engineers©
Chicago District

Installation of Stator

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Installation of Pump Shaft

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Lifting of rotor

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Dropping of Rotor

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Motor Control Cabinet (CCM)

U.S. Army Corps of Engineers©
Chicago District

CCM Cabinet Interior

U.S. Army Corps of Engineers©
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HV Cable Termination

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Chicago District

Vibration Instruments

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Wiring

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Alarm Panel In Pit Area

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Switchboard

Acknowledgements

Pumps Installation

James Kerr, ME, PE CENWP-HDC
Ric Vnanata, EE, PE –Retired, CENWP-HDC
S. Maness, EE, PE CESWP-HDC
John Fahrer, EE, PE CESWP-HDC
Andrew Schimpf, EE, PE CEMVS and others
Joseph Schmidt, PE, CELRC
Umer Patel, ME, PE, CELRC
Henry Stewart, ME, PE, CELRC
Bharat Shah, ME, CELRC
Larry Green, PG; Rich Hurt; Nick Karnezis, PE –CELRC-CO
USAED – USACE, Japan

Construction of Distribution Tunnel

MWH (Montgomery Watson Harza)
Joseph Schmidt, PE, CELRC
Umer Patel, ME, PE, CELRC, Chief Mec/Elec Section
Henry Stewart, ME, PE, CELRC
Lue Tekola, SE, CELRC
Bharat Shah, ME, CELRC
Dave Schieman, CE, CELRC
Larry Green, PG; Rich Hurt; Nick Karnezis, PE –CELRC-CO

U.S. Army Corps
of Engineers©
Chicago District

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USACE, Chicago District

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Mass Notification Systems

U.S. AIR FORCE

03 August 2005

Introduction

- **J-34/ Security Engineering Working Group**
- **AFCESA Technical Report, *Mass Notification Systems*, May 2002 (draft)**
- **UFC 4-010-01, *DOD Minimum Antiterrorism Standards for Buildings,* July 2002**
- **UFC 4-021-01, *Design and O&M: Mass Notification Systems,* December 2002**
  - **2005 Revision In Progress**

Definition

- Mass Notification: The capability to provide real-time information to all building occupants or personnel in the immediate vicinity of a building during emergency situations.
  - All DOD components are required to provide MNS.
  - Includes leased, temporary, expeditionary, permanent structures
  - On- or off-DOD installations

Implementation

- New Inhabited Buildings (includes new primary gathering and new billeting): required as of FY2004 construction program
- Existing Primary Gathering: required as of FY2004 when exceeding 50% replacement value
- Existing Billeting: required as of FY2004 when exceeding 50% replacement value

Building Types

Building Types defined in UFC 4-010-01:

	Billeting	MFH	All Other Buildings
No special requirements	<11 sleeping (unaccompanied)	<13 family units	<11 DoD occupants or population density ≤1-person/40-m^2 (or 1/430-ft^2)
Inhabited	≥11 sleeping (unaccompanied)	**≥13 family units** (Primary Gathering Building)	11≤ DoD occupants <50 and population density >1-person/40-m^2 (or 1/430-ft^2)
			≥50 DoD occupants and population density >1-person/40-m^2 (or 1/430-ft^2) (Primary Gathering Building)

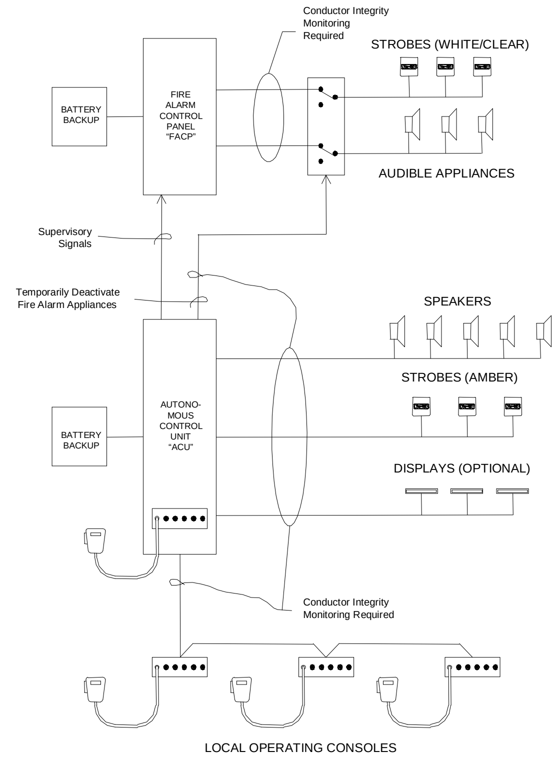
Hatched = Primary Gathering Building

Types of MNS

- Individual Building System
  - Autonomous Control Unit
  - Notification Network
  - Intelligibility/Audio Intensity
  - Local Operating Consoles
- Giant Voice System
- Telephone Alerting System
- Base-wide control system

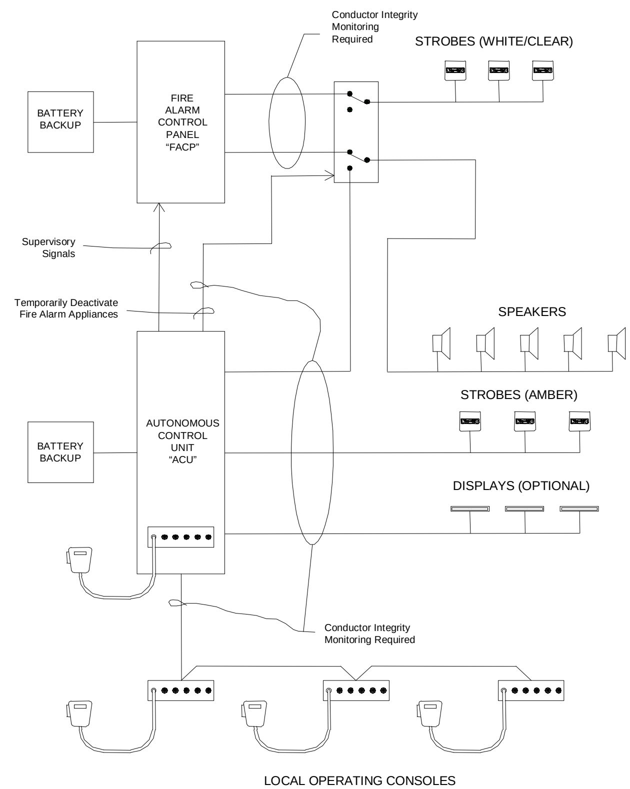
MNS Designs

- Separate FACP and MNS
- Not for Navy use



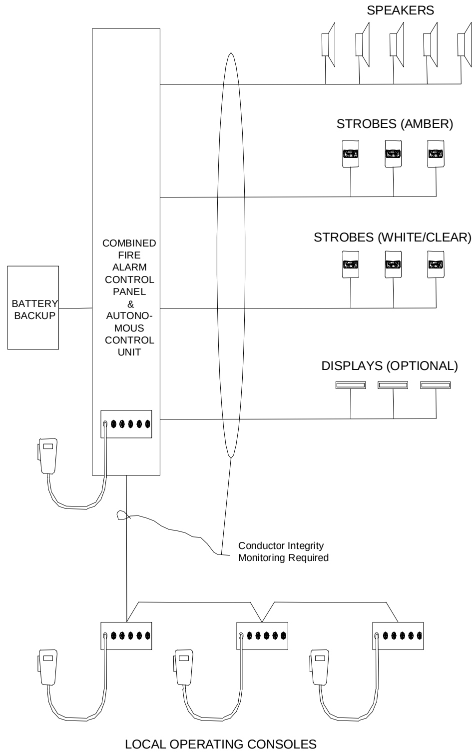
MNS Designs

- Separate FACP and MNS
- Shared Speakers
- Not for Navy use



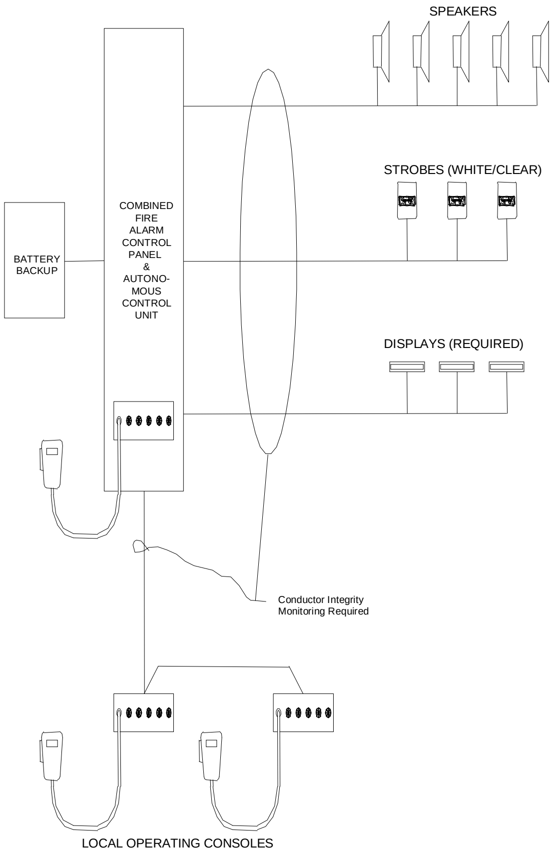
MNS Designs

- Combination FACP and MNS
- Not for Navy use



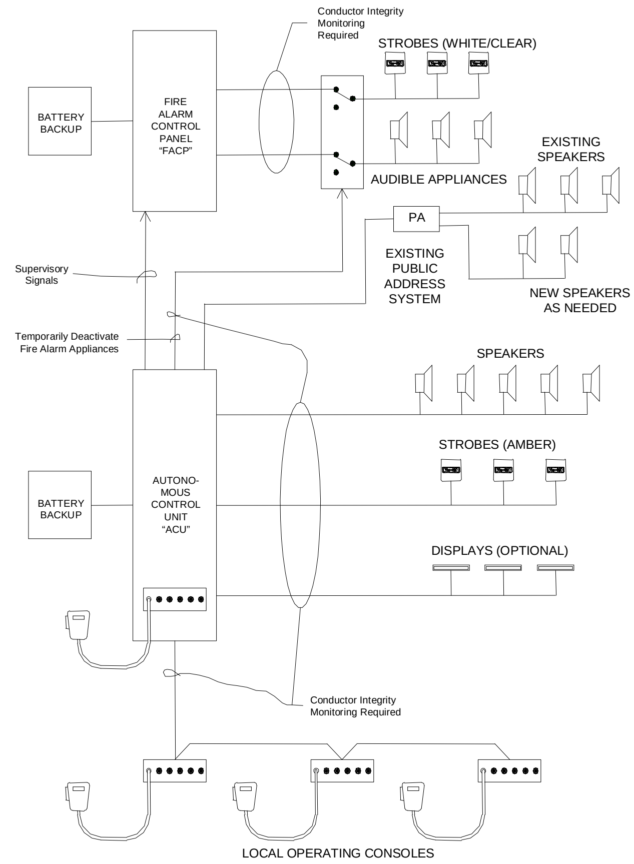
MNS Designs

- **Combination FACP and MNS**
- **Navy Only**



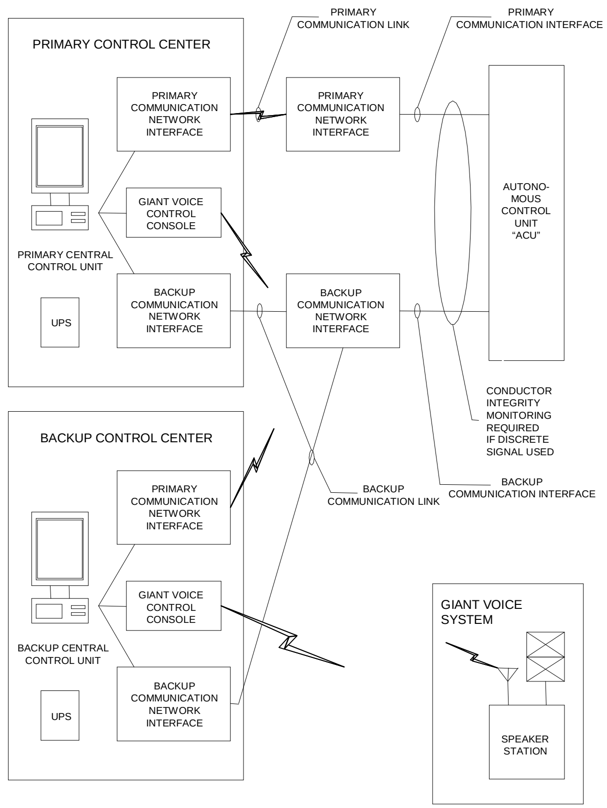
MNS Designs

- Separate FACP and MNS
- Use Existing PA System
- Not for Navy use



MNS Designs

- **Optional Base-wide System**



NFPA 72

- 2003: AF for DoD requested assistance from NFPA in preparing "consensus prepared criteria" for mass notification

- NFPA 72 Alarm Code® Technical Correlation Committee (TCC) was designated to complete the request

  - NFPA 72® is in revision, next edition is due June 2006

- The NFPA 72 TCC prepared a public proposal in the name of the TCC and designated it as Annex G

NFPA 72 (cont.)

- **July 2005: Report on Proposals published on NFPA web site. The 11 NFPA 72 Technical Committees reviewed and posted written responses. Proposed Annex G affects at least five of the technical committees**
- **Public is strongly encouraged to comment on the TC actions, NLT 05 Sep 2005 (www.NFPA.org)**
- **The eleven technical committees will meet 24-29 October to provide written response to comments**
- **Consensus voting for the 2006 edition NFPA 72 at NFPA Annual Meeting, 4-9 Jun 2006**

Hot Issues

- Single Strobe or Dual White/Amber Strobe
- Access/control of Local Operating Consoles
- Combination fire alarm - MNS panels
- Battery Life - 24/15, 24/30-60, 72
- NFPA 72 TC actions/UL listings
- Base-wide control systems
- Modular Structures
- Outdoor Coverage – vicinity of buildings
- Reorganizations of MNS UFC
- New UFGS

Typical Systems

- Wheelock (OEM)
  - Distributors/Installers: Monaco, Simplex-Grinnell, Tyco Safety Products, others

EMNA
Emergency Mass
Notification Appliance

EMNA

(Pictures includes: RSSPA-24MC
E70-24MCW-FW and backboxes
and ISP-2)

Typical Systems

- Monaco (Distributor/Installer)
  - D21 Fire Reporting MNS

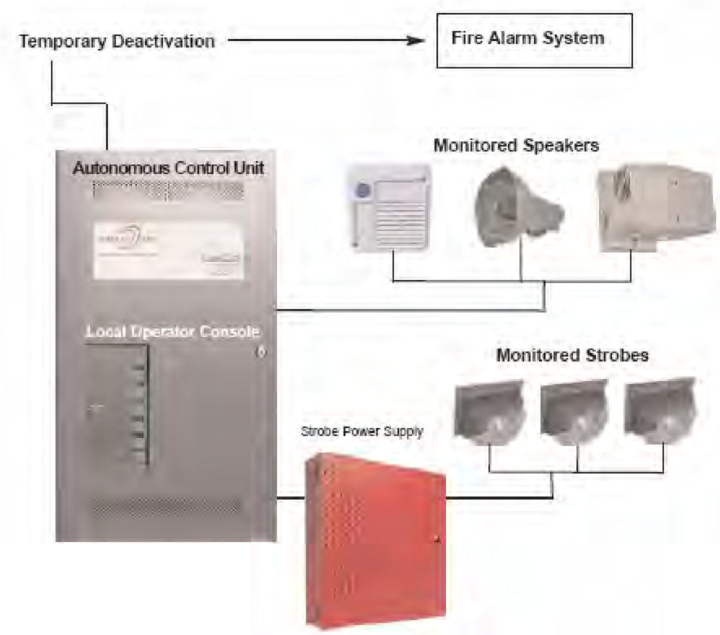
Typical Systems

- **MadahCom Waves (OEM & Distributor/Installer)**

WAVES Autonomous Control Unit - ACU-117
Models - ACU-117-25, ACU-117-50 & ACU-117-100

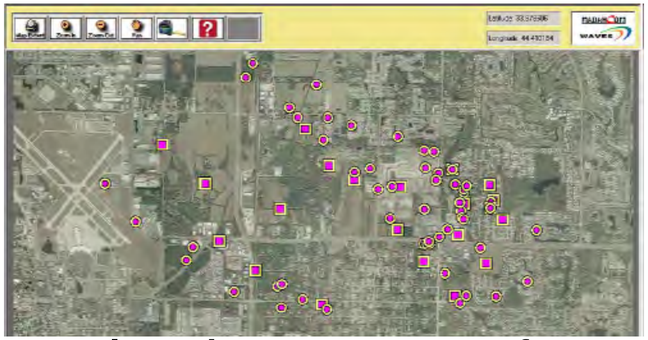
WAVES
www.madah.com

Operates as a Stand-alone Building System or as part of WAVES Base-wide Mass Notification System (MNS)/Personnel Alerting System (PAS)



Typical Systems

- **MadahCom WAVES® (base-wide system)**



Dual Monitor GIS Map Interface

TACWAVES™ Portable Alerting System

U.S. AIR FORCE

POC

Raymond N. Hansen, PE

Address:

HQ AFCESA/CESM
139 Barnes Drive, Suite 1
Tyndall AFB, FL 32403-5319

Phone: 850-283-6317
DSN: 523-6317

E-mail: ray.hansen@tyndall.af.mil

Headquarters U.S. Air Force

Integrity - Service - Excellence

DESIGN CONSIDERATIONS FOR THE PREVENTION OF MOLD

K. Quinn Hart,P.E.

August 2005

Governing Criteria

- **Air Force Engineering Technical Letter (ETL) 04-3: Design Criteria for Prevention of Mold in Air Force Facilities**
  - **Applies to the design of new or renovated Air Force facilities that are less than 35 percent designed**
  - **Effective April 2004**
  - **Intended Users:**
    - Installation civil engineer (CE) personnel
    - Major command (MAJCOM) engineers
    - Project managers (PM)
    - Design consultants
    - **Design agents**

ETL Requirements

- Provide tight building envelopes
- HVAC systems
  - Design Criteria
  - Design Analysis
  - Equipment Specifications
- Protect building materials during construction
- HVAC Commissioning

Building Envelope

- Keep moisture out
  - Effective use of water vapor retarders and air infiltration barriers
  - Seal all openings, seams in barriers, intersections of walls, roofs and floors
- Allow for drainage and drying if/when moisture gets in
- Perform dew point analyses for exterior walls and roof sections

HVAC System-Design Criteria

- System will be designed and sized to maintain space temperature and humidity requirements at the following conditions:
  - Maintain dry bulb set point and 50% RH or less at 1% dry bulb temperature and corresponding mean coincident wet bulb temperature
  - Maintain dry bulb set point and 60% RH or less at 1% humidity ratio and corresponding mean coincident dry bulb temperature

HVAC System-Design Criteria

WARNER ROBINS AFB GA	
Latitude = 32.63 N	WMO No. 722175
Longitude = 83.60 W	Elevation = 295 Feet
Period of Record = 1967 TO 1996	Average Pressure = 29.71 inches Hg

Design Criteria Data

		Mean Coincident (Average) Values			
Dry Bulb Temperature (T)	**Design Value (°F)**	Wet Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	100	77	104	6.8	WNW
0.4% Occurrence	97	77	106	6.4	W
1.0% Occurrence	94	76	107	6.4	W
2.0% Occurrence	92	75	107	6.3	W
Mean Daily Range	21	-	-	-	-
97.5% Occurrence	32	29	18	4.9	NNW
99.0% Occurrence	28	25	14	5.1	NNW
99.6% Occurrence	24	21	11	6.3	NNW
Median of Extreme Lows	17	15	7	8.0	NW
		Mean Coincident (Average) Values			
Wet Bulb Temperature (T_{wb})	**Design Value (°F)**	Dry Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	81	92	138	5.4	E
0.4% Occurrence	79	90	129	5.3	W
1.0% Occurrence	78	88	125	5.1	W
2.0% Occurrence	77	87	122	5.1	W
		Mean Coincident (Average) Values			
Humidity Ratio (HR)	**Design Value (gr/lb)**	Dry Bulb Temperature (°F)	Vapor Pressure (in. Hg)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	152	86	1.00	3.5	E
0.4% Occurrence	137	84	0.90	4.2	S
1.0% Occurrence	132	83	0.87	3.9	W
2.0% Occurrence	128	82	0.84	4.3	W
Air Conditioning/ Humid Area Criteria		$T \geq 93°F$	$T \geq 80°F$	$T_{wb} \geq 73°F$	$T_{wb} \geq 67°F$
	# of Hours	155	1519	1383	3065

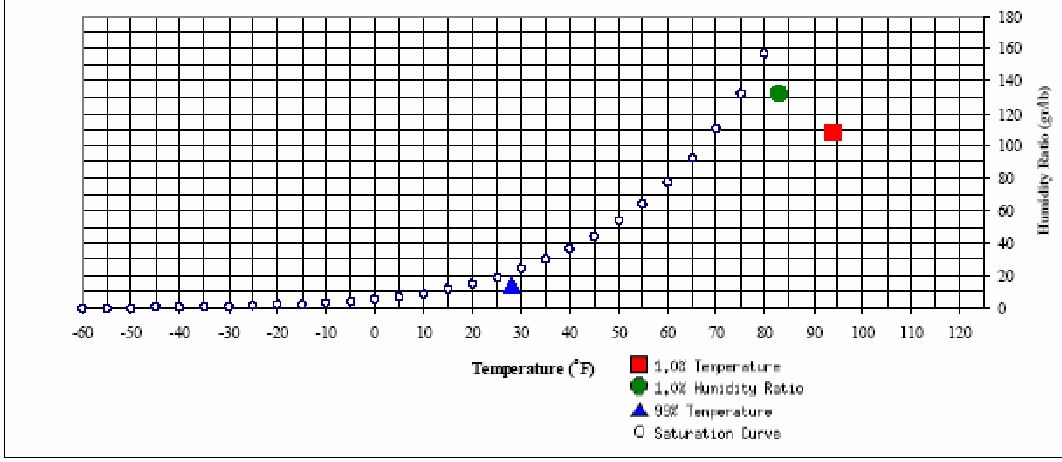
Other Site Data

Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
11	4.0	90	4.8 + 1.7
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft^2)	Average Annual Freeze-Thaw Cycles (#)
66.7	0	5	28

*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 foot additional depth.

HVAC System-Design Criteria

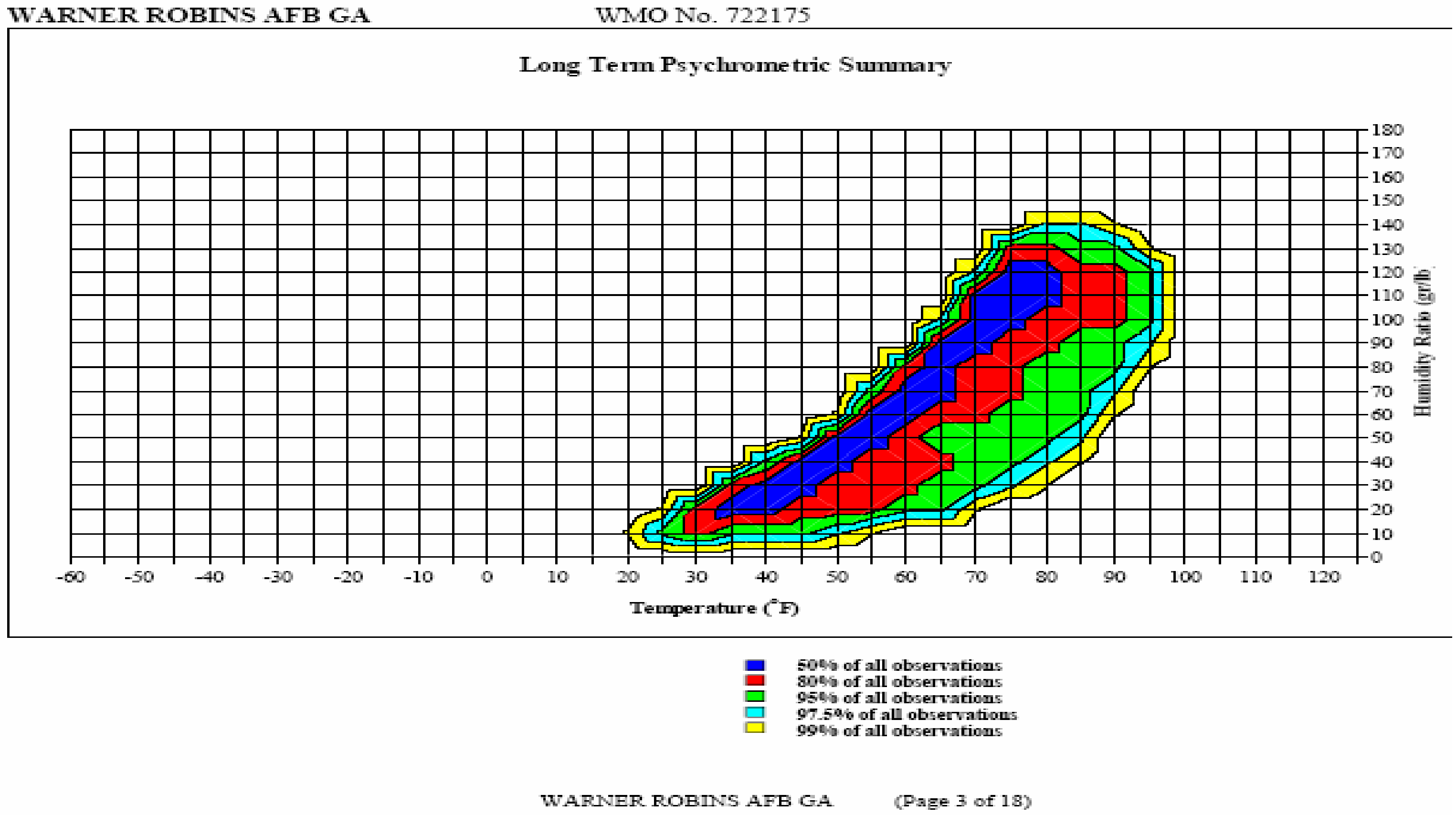
WARNER ROBINS AFB GA WMO No. 722175



	(°F)	MCHR (gr/lb)	Enthalpy (btu/lb)	1.0% Humidity Ratio	(gr/lb)	MCDB (°F)	MCWB (°F)	MC Dewpt (°F)	Enthalpy (btu/lb)
99% Dry Bulb	28	14	8.9		132.3	82.8	77.1	75	40.6

	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
1.0% Dry Bulb	94	108.1	76.2	39.6

HVAC System-Design Criteria



HVAC System-Design Criteria

Dry Bulb Temperature (T)	Design Value (°F)	Mean Coincident (Average) Values: Wet Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	95	78	117	7.6	NNE
0.4% Occurrence	91	78	126	8.6	WSW
1.0% Occurrence	90	78	127	8.2	WSW
2.0% Occurrence	89	78	127	8.4	WSW
Mean Daily Range	15	-	-	-	-
97.5% Occurrence	40	36	24	6.7	N
99.0% Occurrence	36	32	20	7.6	N
99.6% Occurrence	32	28	15	8.8	N
Median of Extreme Lows	27	23	11	9.7	N
Wet Bulb Temperature (T_{wb})	**Design Value** (°F)	Mean Coincident (Average) Values: Dry Bulb Temperature (°F)	Humidity Ratio (gr/lb)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	84	89	164	7.9	WSW
0.4% Occurrence	82	87	153	7.4	WSW
1.0% Occurrence	81	86	147	7.2	WSW
2.0% Occurrence	80	86	142	7.2	WSW
Humidity Ratio (HR)	**Design Value (gr/lb)**	Mean Coincident (Average) Values: Dry Bulb Temperature (°F)	Vapor Pressure (in. Hg)	Wind Speed (mph)	Prevailing Direction (NSEW)
Median of Extreme Highs	162	86	1.07	6.6	W
0.4% Occurrence	157	85	1.04	6.1	WSW
1.0% Occurrence	151	85	1.00	6.4	WSW
2.0% Occurrence	146	84	0.97	5.8	W
Air Conditioning/		$T \geq 93°F$	$T \geq 80°F$	$T_{wb} \geq 73°F$	$T_{wb} \geq 67°F$
Humid Area Criteria	# of Hours	16	1953	2572	4157

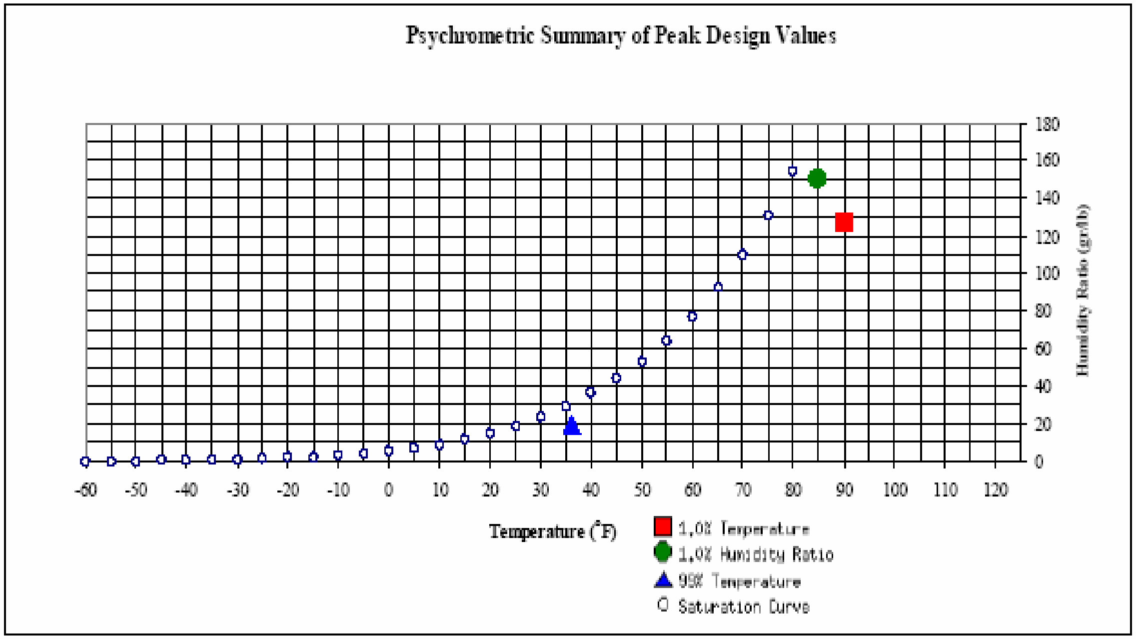
Other Site Data

Weather Region	Rain Rate 100 Year Recurrence (in./hr)	Basic Wind Speed 3 sec gust @ 33 ft 50 Year Recurrence (mph)	Ventilation Cooling Load Index (Ton-hr/cfm/yr) Base 75°F-RH 60% Latent + Sensible
Weather Region	4.8	130	9.1 + 1.8
Ground Water Temperature (°F) 50 Foot Depth *	Frost Depth 50 Year Recurrence (in.)	Ground Snow Load 50 Year Recurrence (lb/ft²)	Average Annual Freeze-Thaw Cycles (#)
70.9	0	0	4

*Note: Temperatures at greater depths can be estimated by adding 1.5°F per 100 feet additional depth.

HVAC System-Design Criteria

TYNDALL AFB FL   WMO No. 747750



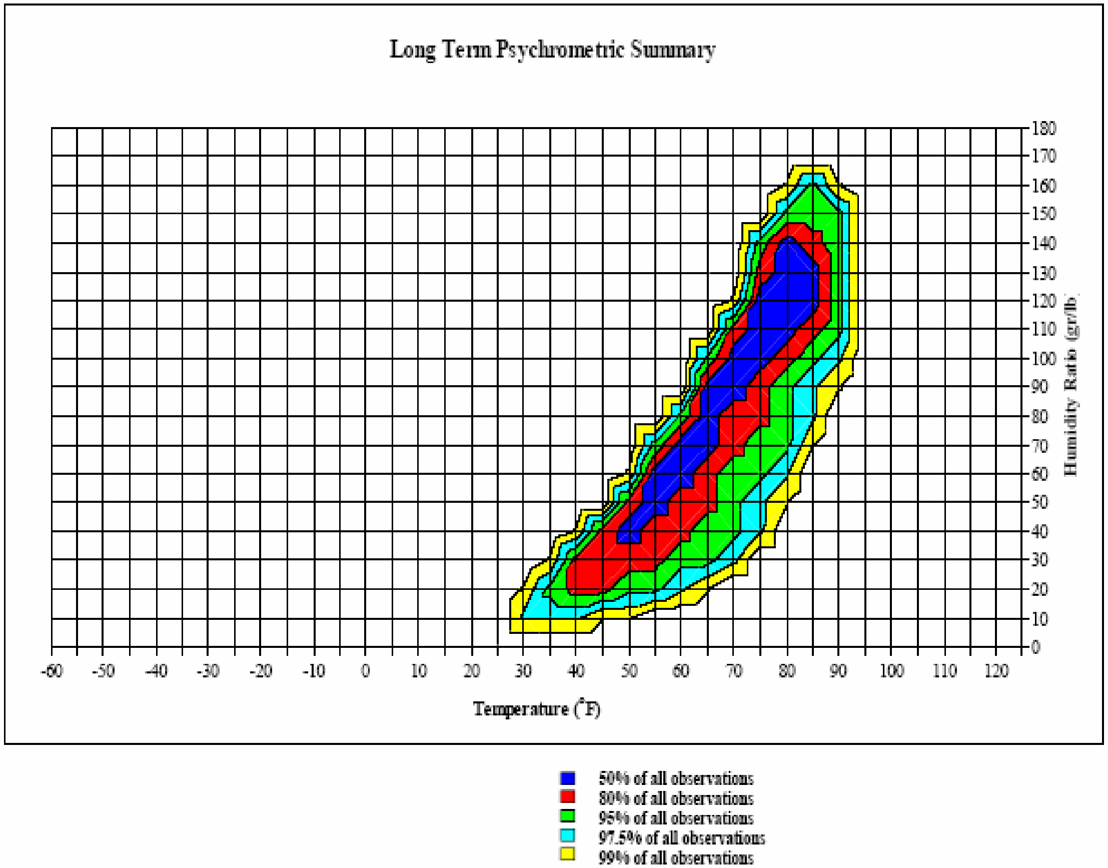
	(°F)	MCHR (gr/lb)	Enthalpy (btu/lb)
99% Dry Bulb	36	19.4	11.6

	(gr/lb)	MCDB (°F)	MCWB (°F)	MC Dewpt (°F)	Enthalpy (btu/lb)
1.0% Humidity Ratio	150.5	84.7	80.4	79	43.9

	(°F)	MCHR (gr/lb)	MCWB (°F)	Enthalpy (btu/lb)
1.0% Dry Bulb	90	126.9	78.4	41.6

HVAC System-Design Criteria

TYNDALL AFB FL WMO No. 747750



TYNDALL AFB FL (Page 3 of 18)

HVAC System-Design Analysis

- **Include calculations and schematics demonstrating the system can achieve and maintain interior temperature and humidity requirements at 1% DB/MCWB and 1% HR/MCDB conditions.**
  - **Include calculations showing:**
    - **System cooling loads (latent and sensible)**
    - **Energy/mass transfer through conditioning equipment**
    - **System schematic indicating dry bulb and wet bulb temperatures (or Humidity ratios) of:**
      - Outside air
      - Mixed air
      - Supply air
      - Return air

HVAC System-Equipment Specifications

- Construction Documents are to specify cooling coil characteristics and performance requirements to include:
  - Total cooling capacity
  - Sensible capacity
  - Coil design entering and leaving air conditions (Wet and Dry bulb temperatures)
  - Design airflow rate
  - Face velocities
  - Coil Sensible Heat Ratio
  - Entering chilled water temperature

U.S. AIR FORCE

HVAC System-Dorms, VQs, TLFs

- **Provide separate, dedicated, central system to supply ventilation air requirements**
  - **System to supply dehumidified and tempered 100% outside air to all occupied spaces**
  - **System not intended to provide total space heating and cooling, only ventilation air**
  - **System must continuously condition and deliver ventilation air without interruption**
  - **Employ active humidity control that will maintain space humidity at less than 60% over a full range of ambient conditions up to and including the 1% HR design condition**

Protect building materials during construction

- **Construction specifications will require all materials be protected from moisture resulting in deterioration or mold growth during storage and construction**

HVAC Commissioning

- Commission systems in accordance with UGFGS 15995, Commissioning of HVAC Systems
  - Verify and Document system performance has met design requirements
  - Load system or test at design conditions

Contact Information

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- HQ AFCESA/CESM
- (850) 283-6343
- Quinn.hart@tyndall.af.mil

US Army Corps of Engineers
Infrastructure Systems Conference

Electronic Security Systems Process Overview

Electronic Security Center

4 August 2005

US Army Corps of Engineers
Engineering and Support Center, Huntsville

Outline

- *About the Electronic Security Center*
- Physical Security System Model
- Project Initiation
  - Identify Need
  - Threat Assessment
  - Vulnerability Assessment
  - Risk Analysis
  - Define Countermeasures
- Designer Responsibilities
- Quality Control
- Criteria

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Engineering and Support
Center, Huntsville

The
Electronic Security Center

- Intrusion Detection Systems

  Mandatory Center of Expertise

- ***Corps of Engineers***

- ***Huntsville, AL***

US Army Corps
of Engineers
Engineering and Support
Center, Huntsville

Electronic Security Center Charter

- AR 190-13 Requirement:
  - Maintain Nucleus of ESS Specialists
  - Respond Expediently to Army ESS Needs
  - Chartered as USACE Mandatory Center of Expertise by ER-1110-1-8158 (Program Management Plan)
- HQUSACE Proponent:
  - CEMP-ET, Mr. Robert A. Fite (202) 761-7169

US Army Corps of Engineers
Engineering and Support Center, Huntsville

Electronic Security Center Mission

- Surveys
- Criteria and Design
- Design Reviews
- Technical Proposal Reviews
- Review Contractor Submittals
- Procure, Install, Test, Start-up Systems
- Teaching
- Special Studies and Investigations

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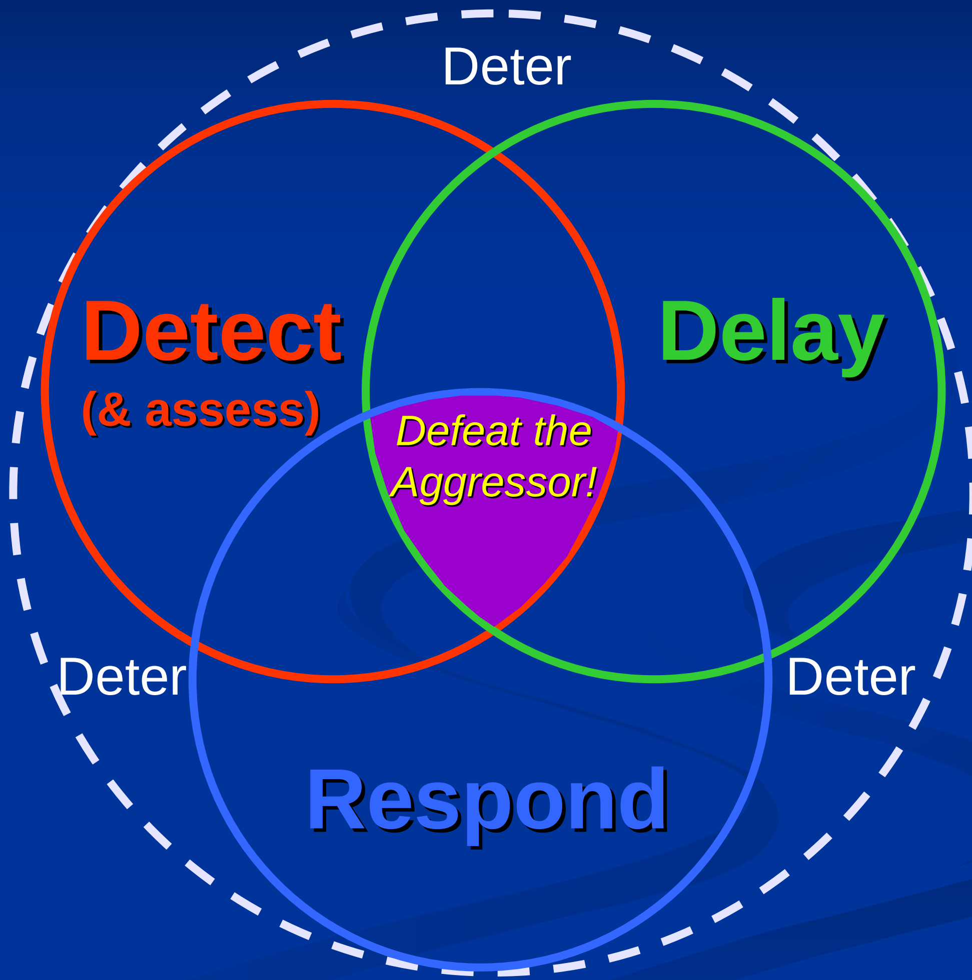
The Physical Security System

US Army Corps
of Engineers
Engineering and Support
Center, Huntsville

Physical Security Model

- ESS enhances the probability of detecting an aggressor before he compromises a protected asset.
- Delay and response elements are required to defeat the aggressor after he is detected.



ESS is only one component of physical security…

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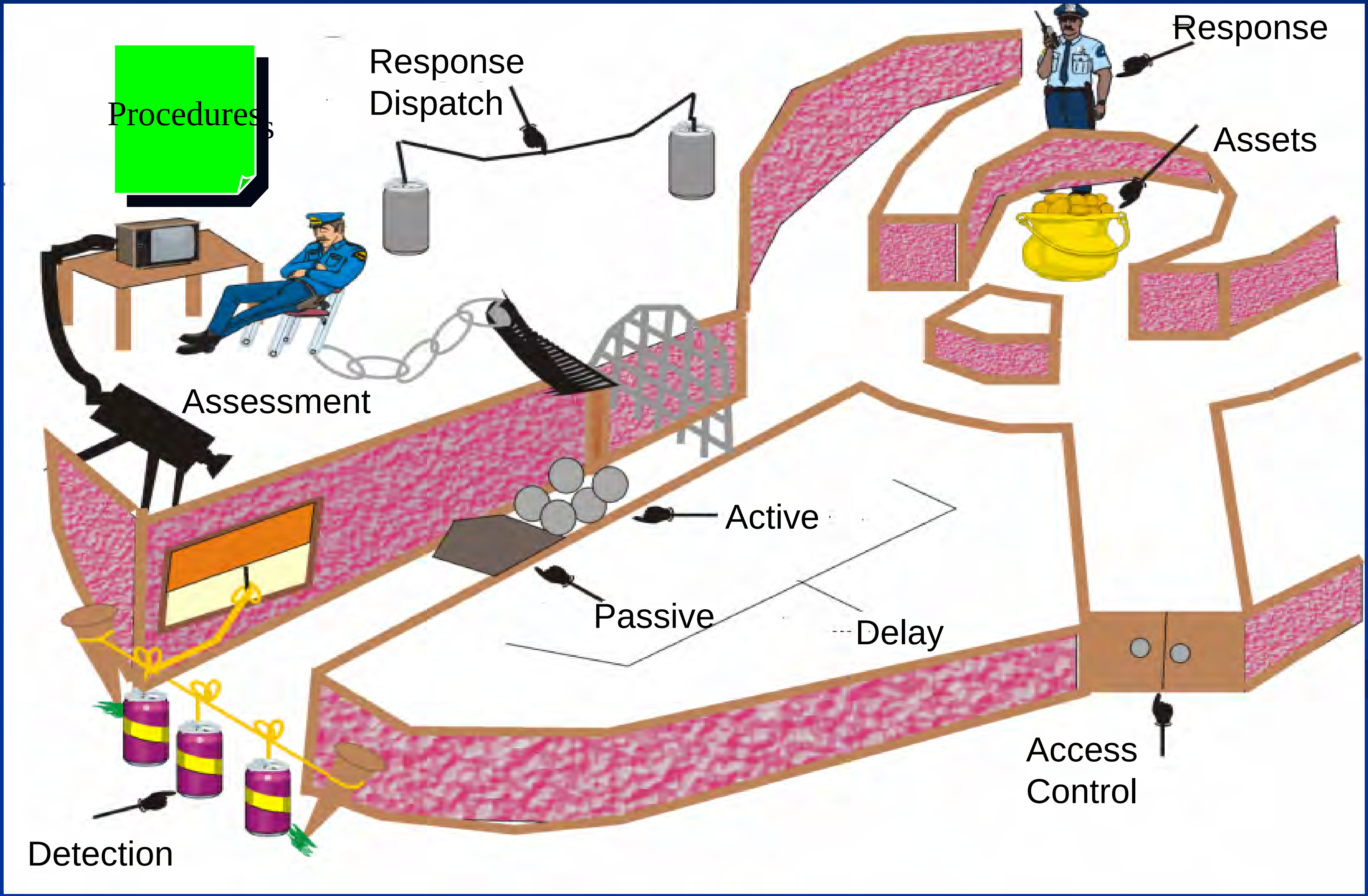
Engineering and Support
Center, Huntsville

Functional Elements of an Effective Security System



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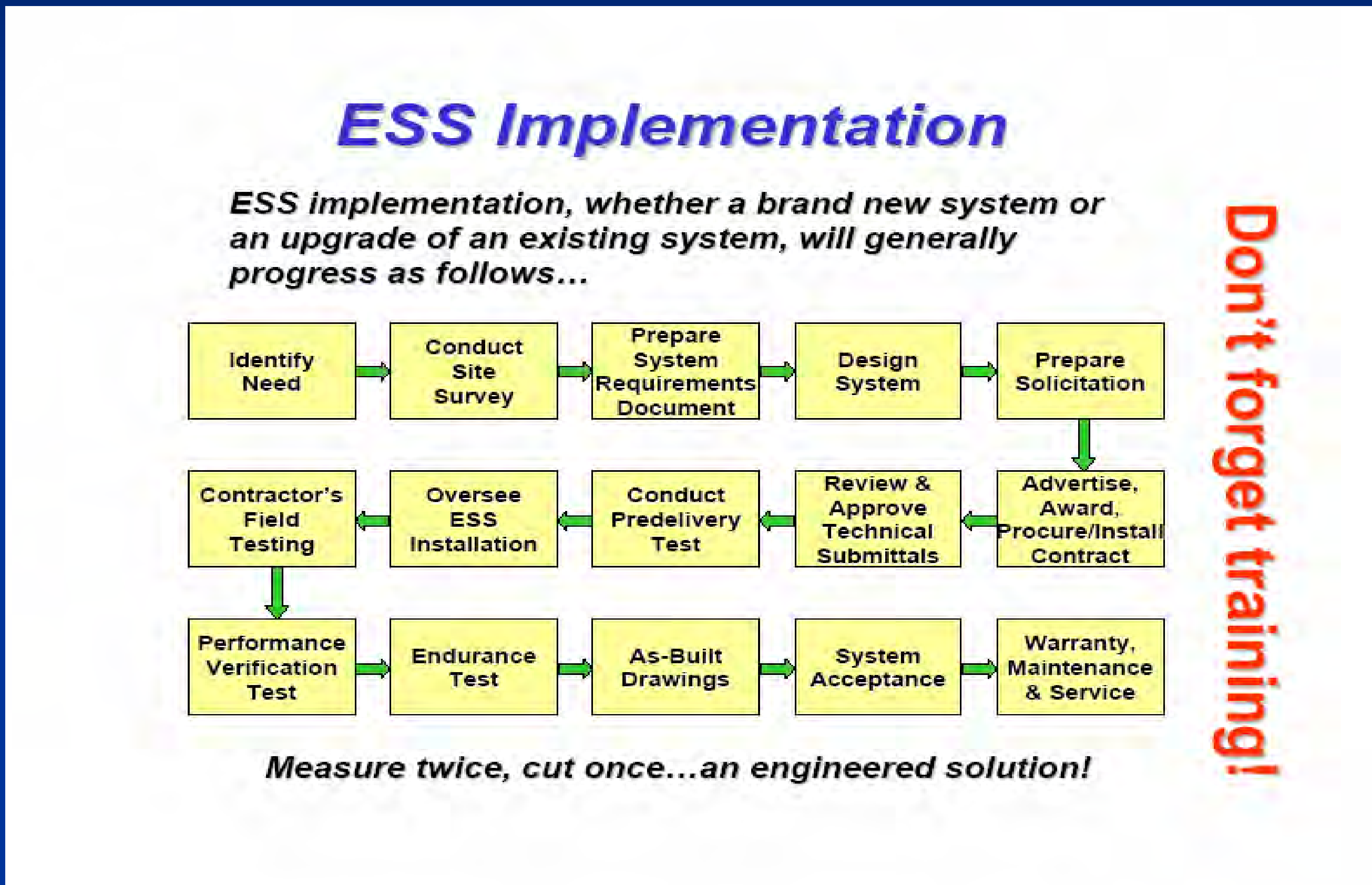

Identify Need

- **Basis of Need**
- **Assess Threats**
- **Assess Vulnerability**
- **Analyze Risk**
- **Define Countermeasures**

Team Effort - Cannot be done by one person

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Basis of Need

- **Regulatory Compliance**
  (thou shall…)

- **Risk Management**
  (smart, cost effective)

US Army Corps of Engineers

Engineering and Support Center, Huntsville

Army Regulatory Requirements

	AR 190-13	AR 190-11	AR 190-16	AR 190-51	DA PAM 190-51	AR 380-19	AR 37-103	DCID 1/21	AR 50-5-1	AR 190-59
ARMS, AMMUNITION, & EXPLOSIVES (AA&E)	X	X								
MEDICAL FACILITIES	X			X	X					
ADP FACILITIES	X					X				
SENSITIVE COMPARTMENTED INFO FACIL (SCIF)	X							X		
COMMO FACILITIES	X		X		X					
FINANCE & ACCOUNTING OFFICES (F&AO)	X			X	X					
ARMY MUSEUMS	X			X						
COMMISSARIES/WAREHOUSES	X			X	X					
CENTRAL ISSUE FACILITY (CIF)	X			X	X					
TRAINING AIDS SUPPORT CENTER (TASC)	X			X	X					
POL STORAGE	X			X	X					
COMMO/ELECTRONICS STORAGE	X			X	X					
REPAIR PARTS STORAGE	X			X	X					
ENG SUPPLIES/CONST MATERIALS	X			X	X					
MAIL/POSTAL	X									
NUCLEAR STORAGE AREAS	X								X	
CHEMICAL STORAGE AREAS	X									X
MILITARY/CIVILIAN WORKS	X									

Risk Management

$$R = P_A * C * (1-P_E)$$

where

R = Risk associated with specific threat/asset scenario

P_A = Likelihood of adversary attack

C = Consequences of successful attack

P_E = Security system effectiveness in mitigating the attack

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The Countermeasures Decision Process

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Threat Assessment

- Normally Already Done for Military Facilities
  - Requirements Implemented by Regulation
- Requires Identification of:
  - Assets Requiring Protection
  - Threat Sources
  - Threat Actions
  - Threat Characteristics
  - Threat Tools
  - Severity of Success on the Asset
- Evolving Threats Must be Considered

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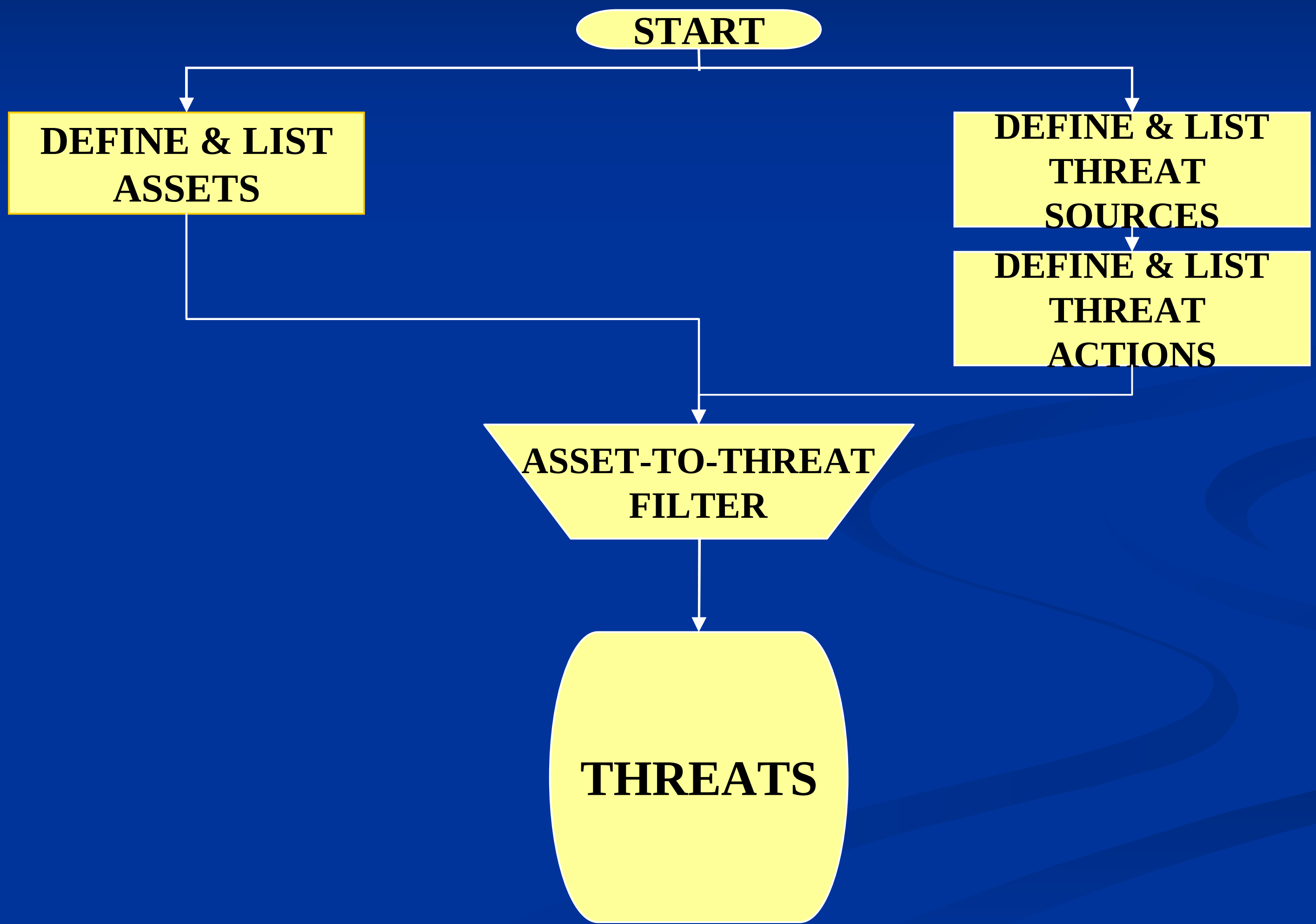
Threat Assessment



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Assets

- PEOPLE: Includes all persons who may venture on the property.
  - Some distinct groups may require unique protective measures.
  - These groups include High-Ranking Executives, Employees, Occasional Visitors to private spaces, and the public.
- EQUIPMENT: Those things of value that are not built into a building and are not consumable.
- BUILDINGS: Real property of the asset.
- FUNDS: Funds as assets refer to negotiable documents or cash that are required for normal operation of the agency.
- MATERIAL: Materials include consumable supplies or merchandise needed in the conduct of normal business.
- REPUTATION: The reputation of the agency and its public perception.
- PERSONAL PROPERTY: The property owned by employees or visitors while on the protected property.
- INFORMATION: Information in any form — paper copies, digital, electronic print, electronic images, audio recordings, etc.

Building an Assets List

- Group Assets That Require Similar Protection
- Locate Assets That Require Similar Protection
- Determine Level of Protection Required for Each Category of Asset

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Threat Sources

- Terrorists
- Extremists
- Organized Crime
- Saboteurs
- Sophisticated Criminals
- Unsophisticated Criminals
- Insiders
- Spies

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Threat Actions

- ROBBERY: Stealing by threat to persons in occupied premises.
- BURGLARY: Breaking & entering unoccupied premises to steal.
- SABOTAGE: Intentional destruction of material, equipment, or systems to disrupt services or processes.
- VANDALISM: Intentional destruction or damaging property for vengeance or marking turf.
- THEFT OF KNOWLEDGE: Theft of information that may or may not be known to be lost.
- KIDNAPPING & HOSTAGE TAKING: Kidnapping is forceful abduction of some individual with the holding location generally unknown. With hostage taking, the holding location is generally known
- INJURY OR DEATH (Battery): The inflicting of injury or death by an adversary against another person.
- ASSAULT: The attempt or perceived threat of injury or death.
- DISRUPTION OF SERVICES: Those actions taken by adversaries that go beyond destruction of material, equipment, or systems.
- DEVASTATING ATTACK: An attack with the purposes of mass destruction of property and multiple deaths and injuries.

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Vulnerability Assessment

- Most Data Collected During a Site Survey
  - Observational Data Collection
  - Interviews
- Identify Weaknesses and Examine Effectiveness of Countermeasures Against Threats
  - Vulnerabilities = Difference Between Existing Protection and Needed Protection
- Use Results of Threat Assessment to Determine Vulnerabilities
  - Compare Existing Security Measures Against Threat

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Site Survey

- **Survey Team -- (Typically 2 to 4 people)**
  - **Facility User/Operations**
  - **DPW/Logistics**
  - **DOIM/Communications**
  - **Safety**
  - **Security**
    - **Local**
    - **IDS-MCX or MACOM**

Performing the Survey

- Know who your customer is
- In-Brief
- Drawing Packages
  - As-builts for existing ESS
  - Infrastructure
  - Electronic copies if available
- Threat Assessment
- Visit facilities or assets to be protected
- Environmental considerations
- Formulate existing conditions and recommended actions
- Exit Briefing
- Report Generation

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Risk Analysis

- Determine Adverse Consequences (Impact) of Threat Event
  - Loss of Life
  - Loss of Capability
  - Cost
- Determine Probability of Threat Occurrence
  - Use Weighted Factors
  - Knowledgeable Professionals Reduce Subjectivity (Educated Guessing)

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Ways of Dealing with Risk

- Apply Preventive Measures that Prevent an Adverse Occurrence
- Apply Contingent Measures that Reduce the Adverse Impact of an Adverse Occurrence
- Accept the Risk
  - Usually Selected If:
    - The Impact Is Low
    - The Probability of Occurrence Is Low
    - No Solution Offered by Technology

Define Countermeasures

- Develop Alternatives For Reducing Vulnerabilities
- Key Considerations:
  - Cost
  - Effectiveness
  - Interoperability
  - Regulatory Requirements

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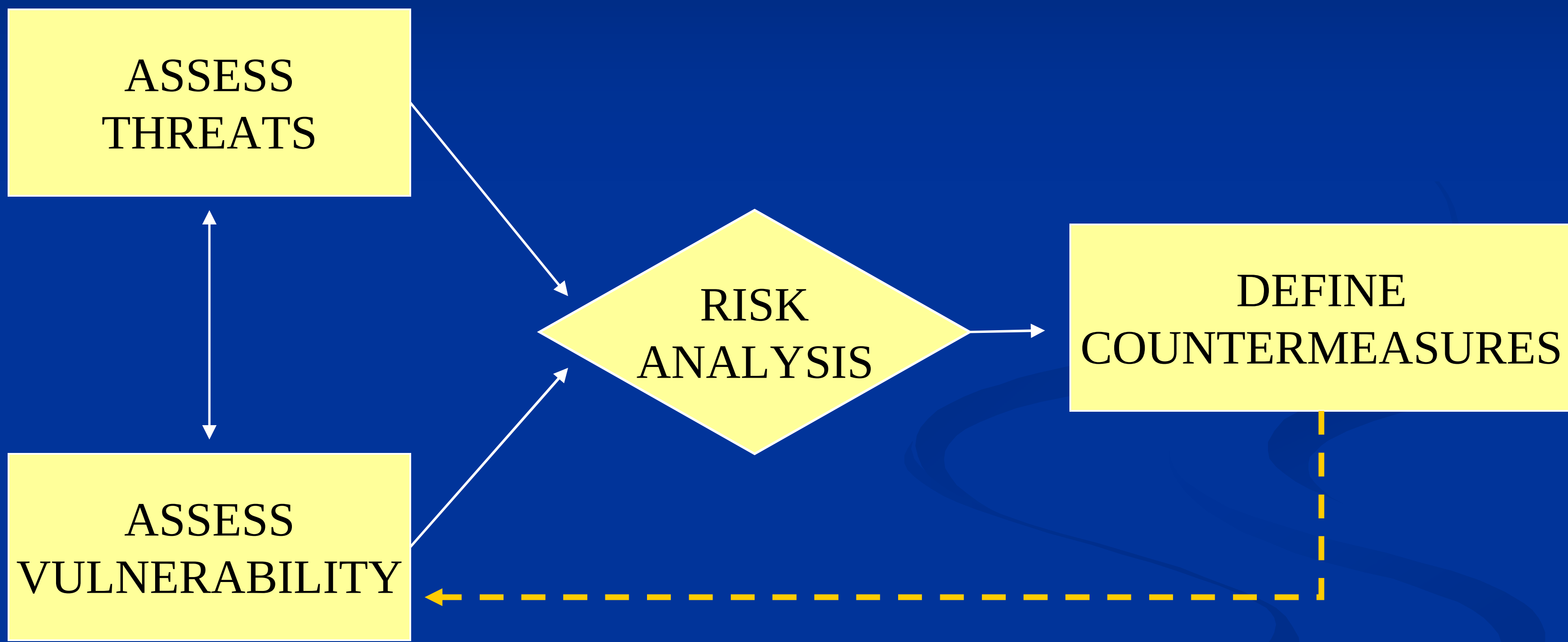
Validate Decisions



Designer Responsibilities

- Work With the End User to Define Basic Factors
  - Threat Conditions at a Facility/Asset
  - Identify Security Vulnerabilities
  - Specify the Security System Requirements
  - Determine Site Operational/Environmental Conditions
  - Resolve Cost Considerations/Constraints
- Resolution of the Basic Factors is a Critical First Step and Must be Completed Before:
  - Initiating Engineering Design
  - Hardware/Software Acquisition
  - Integration and Installation Activities

Criteria

- **Unified Facilities Criteria**
  - UFC 4-020-01FA : Security Engineering Project Development
  - UFC 4-020-02FA : Security Engineering Concept Design
  - UFC 4-020-03FA : Security Engineering Final Design
  - UFC 4-020-04FA : Security Engineering Electronic Security Systems

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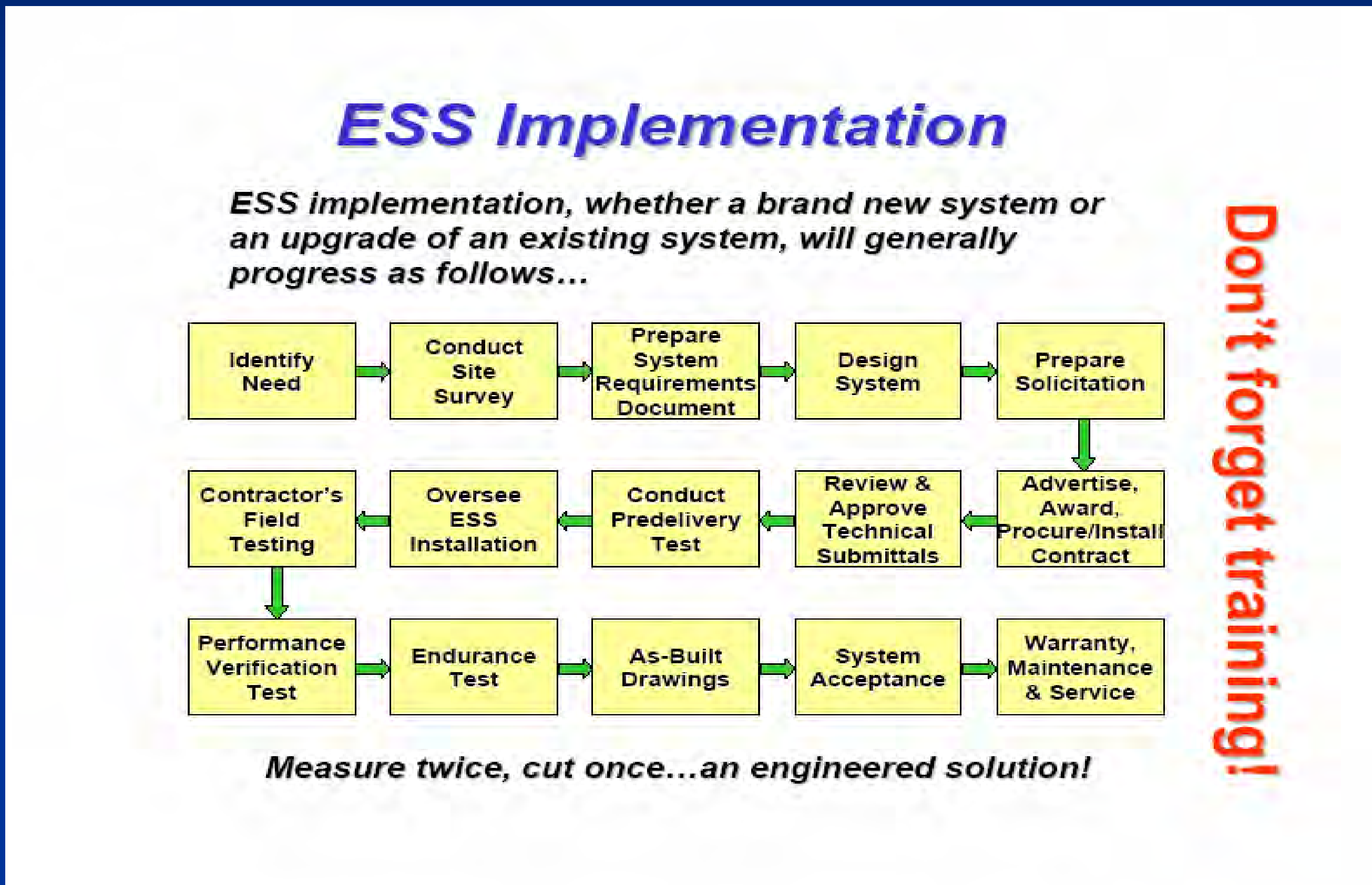

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Elements of a Security System

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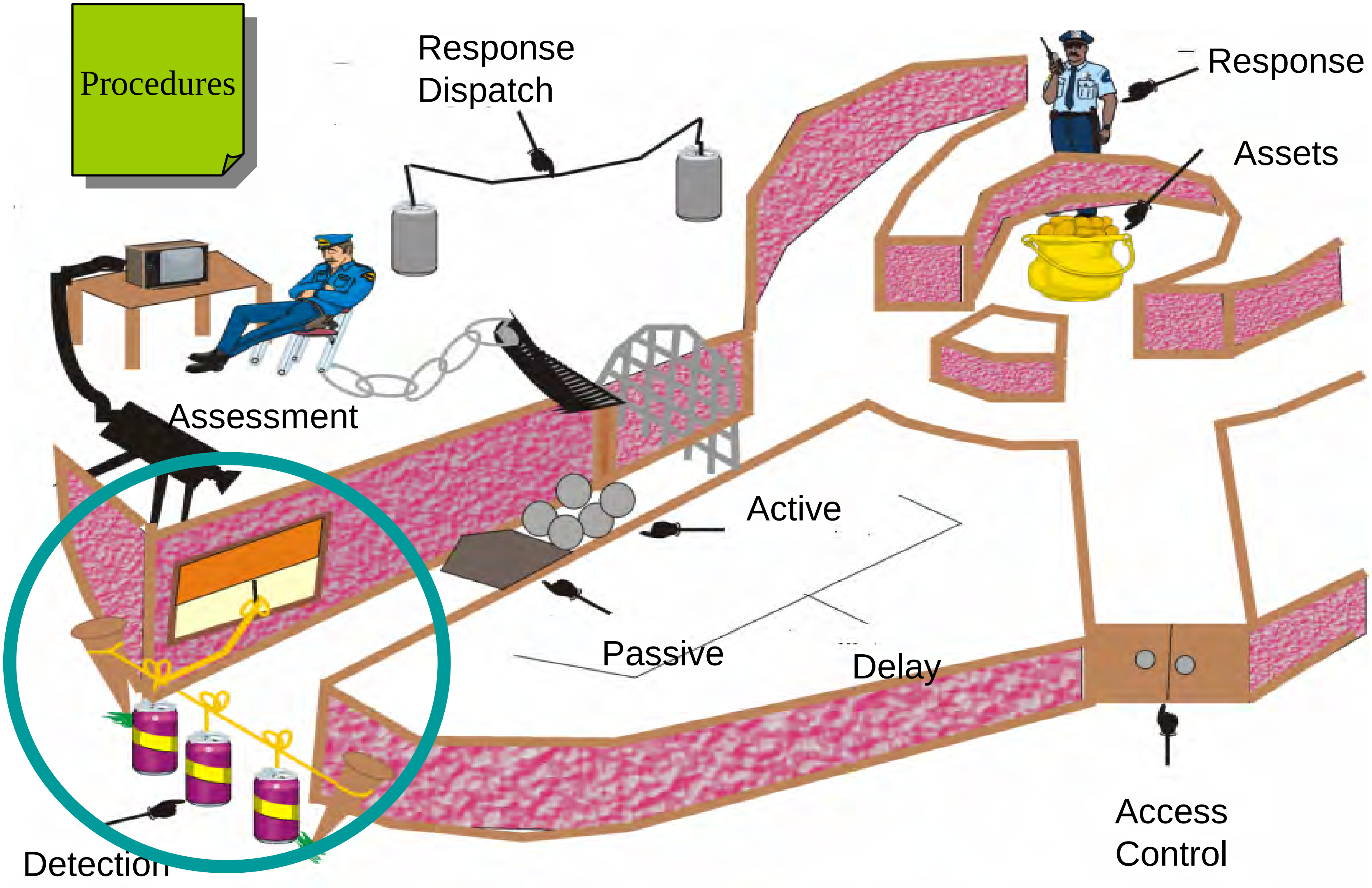
Functional Elements of an Effective Security System



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Detection

- Sensing a Specified Target Moving Through a Line of Demarcation
  - Interior Sensors Suitable for Expected Target
  - Exterior Sensors Suitable for Expected Target
  - Limited to Areas Free of Likely Nuisance Alarm Sources
  - Continuous Ring or Area Surrounding Assets

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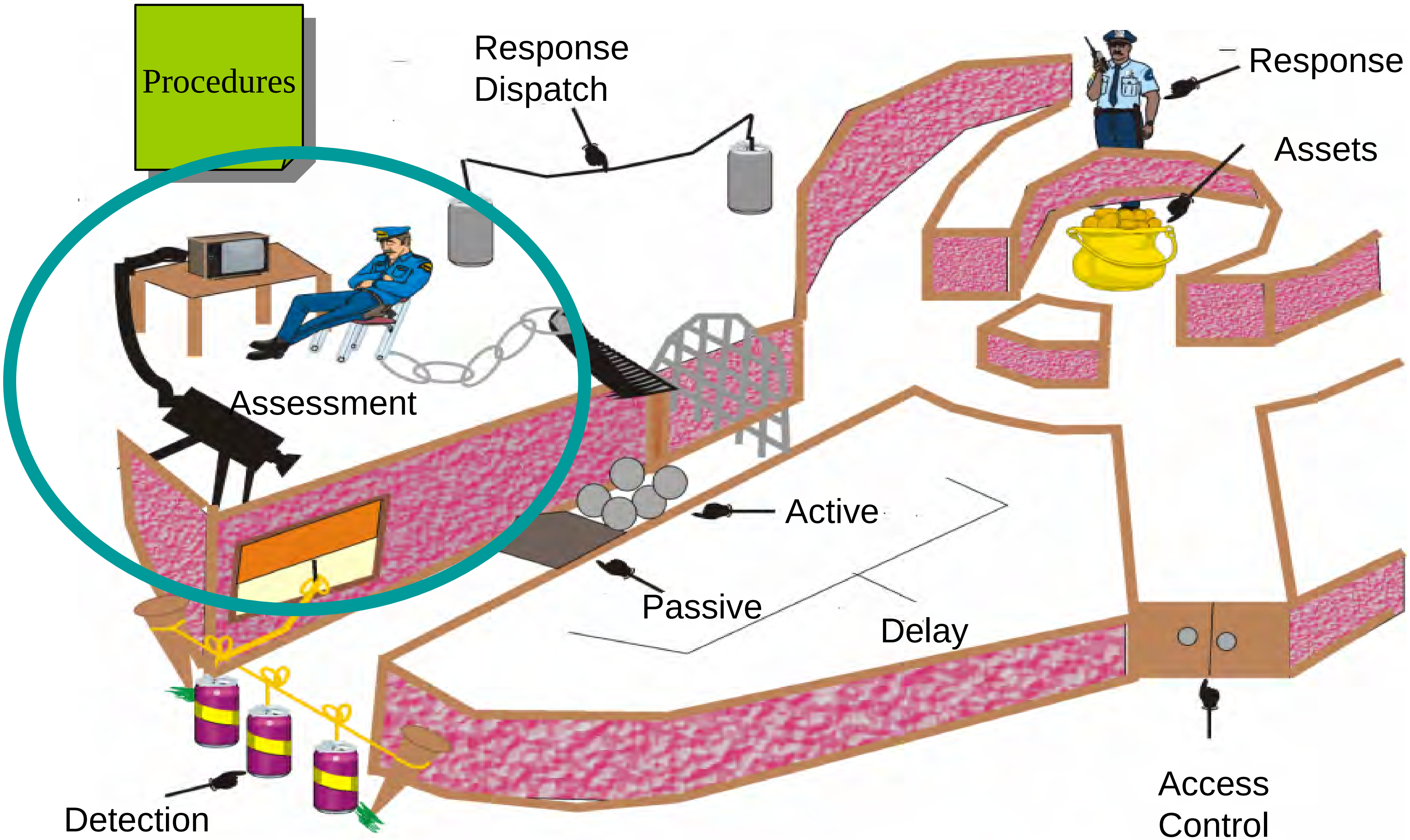
Functional Elements of an Effective Security System



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Assessment

- Visual Evaluation of a Detected Target
  - Validates a Detection As Threat or Non-Threat
  - Offers Additional Information About Target
    - Direction of Movement
    - Speed of Movement
    - Numbers of Targets
    - Tools or Armament of Targets
  - Coordinated With Detection
  - Information Assists Response Forces
- Assessment is Time Sensitive
  - Guard Direct Assessment
  - Guard CCTV Remote Assessment

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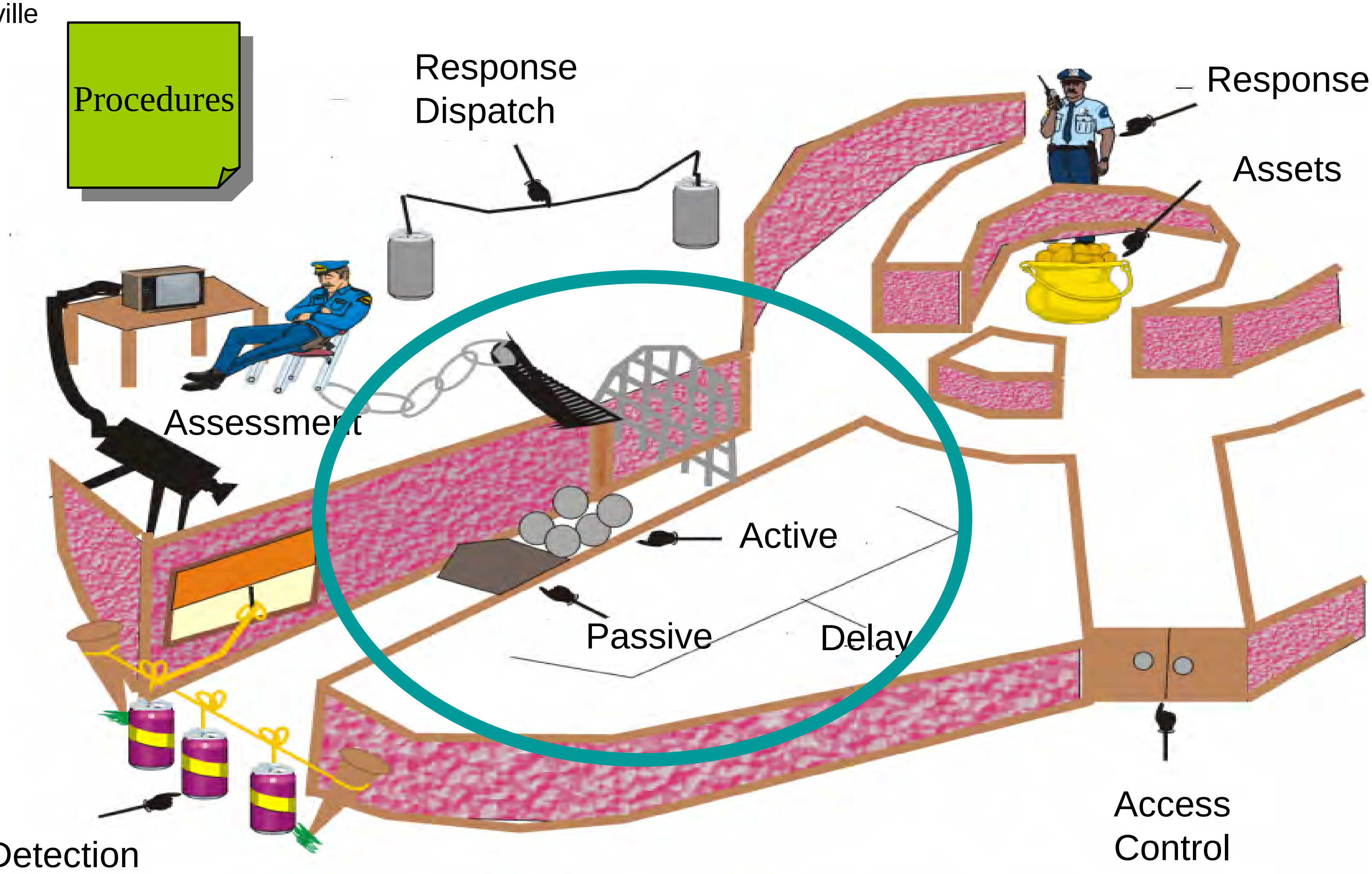
Functional Elements of an Effective Security System



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Delay

- Features That Slow Intruders Until Response Forces Can Intercept
  - Consist of Some Form of Barrier
    - Man-Made or Natural
    - Active or Passive
- Barriers Are Often Tailored for Selected Threat Characteristics

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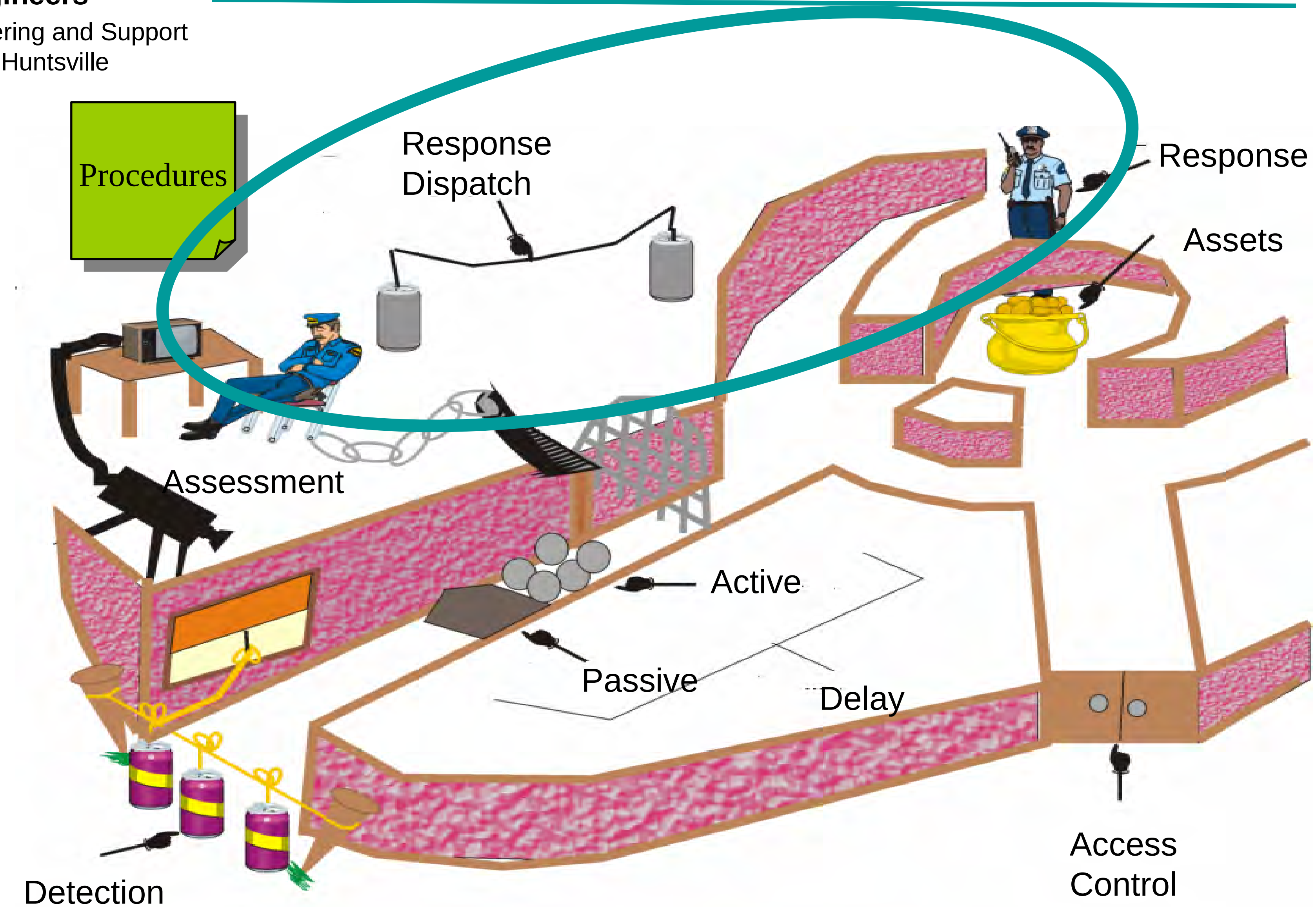
Functional Elements of an Effective Security System



Response

- Action Taken to Prevent Intruders From Accomplishing Their Objectives Against an Asset
  - Consists of Response Forces, Weapons, Vehicles Communications, and Tactics
  - Deployment Time Influences System Response Time and Delay Time Requirements
  - Must Be Structured to Be Effective for an Entire Range of Intrusions
- Security Strategy
  - Denial
  - Containment
  - Forensic

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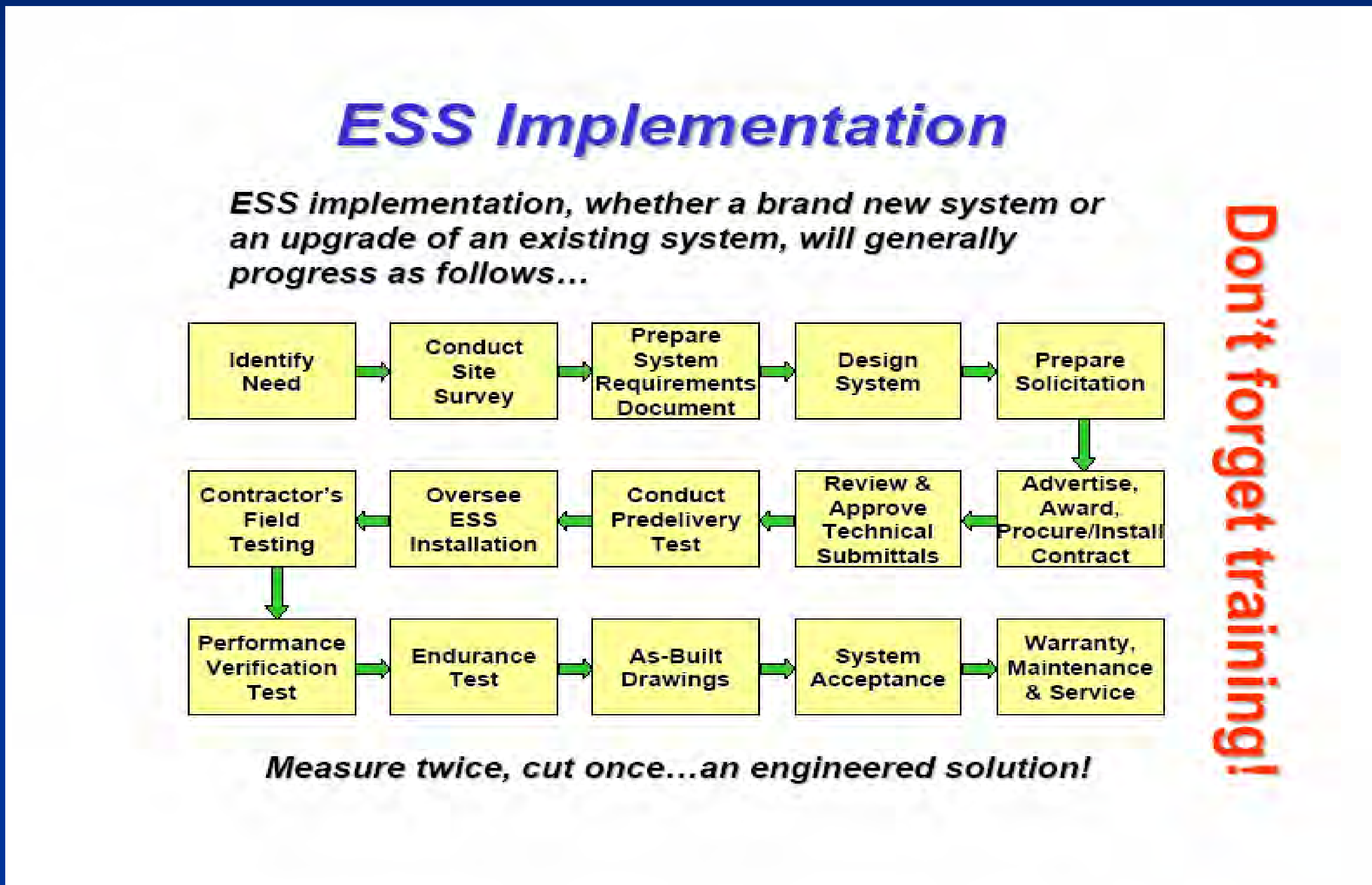

Quality Assurance

- Review of Data Packages
  - System Drawings
  - Manufacturer's Data
  - Certifications
  - Testing
    - Pre-delivery Testing
    - Contractor's Field Tests
    - Performance Verification Testing
    - Endurance Testing

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Criteria

- **Unified Facility Guide Specifications**
  - **UFGS 13720A: Electronic Security System (ESS)**
  - **UFGS 13721A: Small Electronic Security System**
  - **UFGS 16751A: Closed Circuit Television System (CCTV)**
  - **UFGS 13702N: Basic Intrusion Detection System (IDS)**
  - **UFGS 13703N: Commercial Intrusion Detection System (IDS)**

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Criteria

- **Unified Facility Guide Specifications**
  - UFGS 16792A: Wireline Data Transmission Systems
  - UFGS 16794A: Coaxial Data Transmission Systems
  - UFGS 16768A: Fiber Optic Coaxial Data Transmission Systems

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Criteria

(Under Development)

- **Unified Facilities Criteria**
  - Electronic Security Systems
  - Pre-Delivery Test Procedures
  - Performance Verification Test Procedure
- **Unified Facility Guide Specifications**
  - Update to CCTV Spec (Navy)

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Criteria

(Proposed)

- **Unified Facilities Criteria**
    - ESS Equipment Siting Guide
    - Update FT Pistol ESS Typical Design Drawings
- **Unified Facilities Guide Specifications**
    - Wireless Data Transmission System
    - Stand-alone Mass Notification System
    - Video Intercom System
    - Mobile Relocatable Central Monitoring Station
    - Update to 13720 for Wide Area Sensors

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Questions?

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- Cell: 256-656-7557
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  - US Army Engineering and Support Center, Huntsville
  - Electronic Security Center

COMMISSIONING

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presented by

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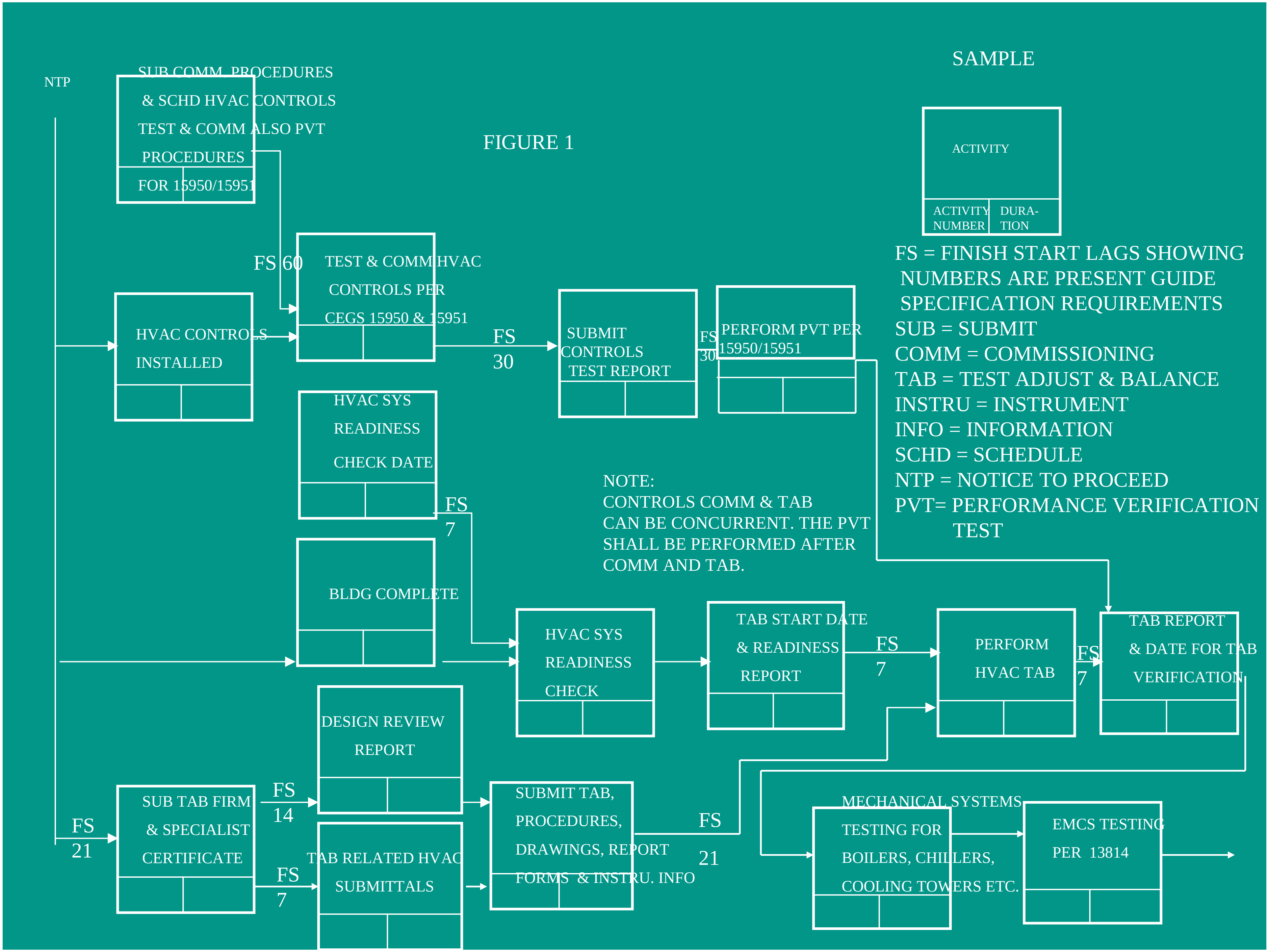
WHY? --- COMMISSIONING GOALS

- *Improve system performance*
- *Lower operating and maintenance costs*
- *Lower repair costs*
- *User comfort, safety & IAQ*
- *Owner quality verification*
- *Conforms with design intent*

CONSTRUCTION PROBLEMS

- Commissioning Schedule & Cost
- Design deficiencies
- Construction deficiencies
- Product quality
- HVAC controls operation
- Energy


SAMPLE
ACTIVITY
ACTIVITY NUMBER
DURA-TION
FIGURE 1
NTP
SUB COMM. PROCEDURES & SCHD HVAC CONTROLS TEST & COMM ALSO PVT PROCEDURES FOR 15950/15951
FS 60
TEST & COMM HVAC CONTROLS PER CEGS 15950 & 15951
HVAC CONTROLS INSTALLED
FS 30
SUBMIT CONTROLS TEST REPORT
FS 30
PERFORM PVT PER 15950/15951
HVAC SYS READINESS CHECK DATE
FS 7
BLDG COMPLETE
HVAC SYS READINESS CHECK
TAB START DATE & READINESS REPORT
FS 7
PERFORM HVAC TAB
FS 7
TAB REPORT & DATE FOR TAB VERIFICATION
NOTE:
CONTROLS COMM & TAB CAN BE CONCURRENT. THE PVT SHALL BE PERFORMED AFTER COMM AND TAB.
FS = FINISH START LAGS SHOWING NUMBERS ARE PRESENT GUIDE SPECIFICATION REQUIREMENTS
SUB = SUBMIT
COMM = COMMISSIONING
TAB = TEST ADJUST & BALANCE
INSTRU = INSTRUMENT
INFO = INFORMATION
SCHD = SCHEDULE
NTP = NOTICE TO PROCEED
PVT= PERFORMANCE VERIFICATION TEST
DESIGN REVIEW REPORT
FS 21
SUB TAB FIRM & SPECIALIST CERTIFICATE
FS 14
FS 7
TAB RELATED HVAC SUBMITTALS
SUBMIT TAB, PROCEDURES, DRAWINGS, REPORT FORMS & INSTRU. INFO
FS 21
MECHANICAL SYSTEMS TESTING FOR BOILERS, CHILLERS, COOLING TOWERS ETC.
EMCS TESTING PER 13814

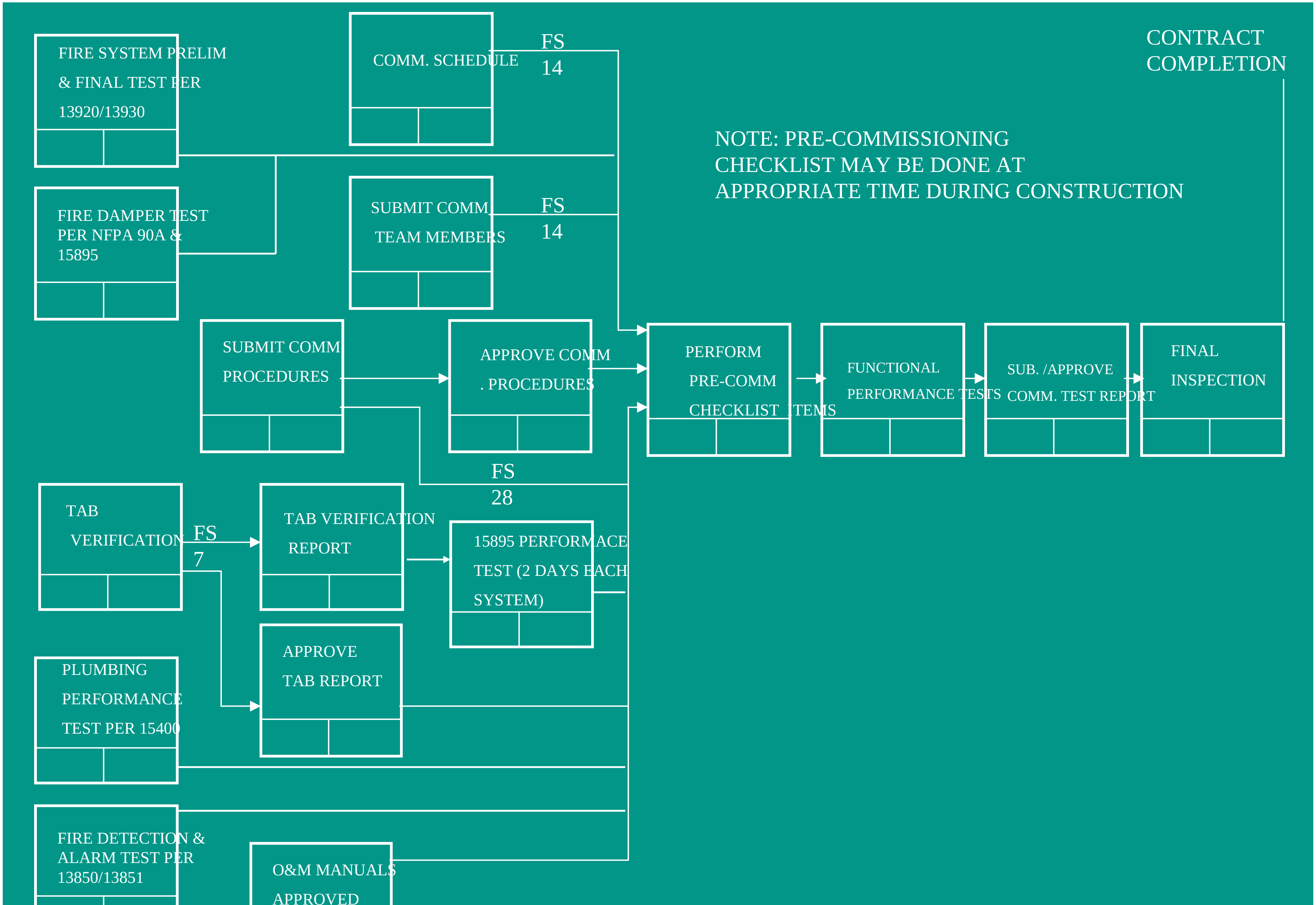

FIRE SYSTEM PRELIM & FINAL TEST PER 13920/13930
COMM. SCHEDULE
FS 14
CONTRACT COMPLETION
NOTE: PRE-COMMISSIONING CHECKLIST MAY BE DONE AT APPROPRIATE TIME DURING CONSTRUCTION
FIRE DAMPER TEST PER NFPA 90A & 15895
SUBMIT COMM. TEAM MEMBERS
FS 14
SUBMIT COMM PROCEDURES
APPROVE COMM . PROCEDURES
PERFORM PRE-COMM CHECKLIST ITEMS
FUNCTIONAL PERFORMANCE TESTS
SUB. /APPROVE COMM. TEST REPORT
FINAL INSPECTION
FS 28
TAB VERIFICATION
FS 7
TAB VERIFICATION REPORT
15895 PERFORMACE TEST (2 DAYS EACH SYSTEM)
APPROVE TAB REPORT
PLUMBING PERFORMANCE TEST PER 15400
FIRE DETECTION & ALARM TEST PER 13850/13851
O&M MANUALS APPROVED

FIGURE 2

INTRODUCTION

- Building commissioning - HVAC, plumbing, electrical, fire protection
- Pre-design, design, construction, acceptance, post-acceptance

ASHRAE GUIDE 1-1996

■ *Pre-design*	*Planing Meetings*
■ *Design*	*BCO Reviews*
■ *Construction*	*QA/QC*
■ *Acceptance*	*Final Testing Verification*
■ *Post-acceptance*	*Warranty*

UFGS – 15995A

- *Commissioning team*
- *Required @ contract completion*
- *After 15950 & 15990 is complete*
- *After all tests, reports & O&M Manuals*
- *Repetitive inspection & testing*
- *Pre-commissioning checklists*
- *Functional performance checklists*

PRE-COMMISSIONING

- Installation Checklist
- Required by Contract at Job Completion
- Should be Performed as Scheduled?
- Perform Control & Electrical Testing Later?
- Contractor to Complete Master Checklist

FUNCTIONAL PERFORMANCE

- System Testing Checklist
- COE Requires Repetitive Testing
  - Pre-commissioning Checks
  - Functional Performance Tests
- Other tests are independent from 15995
- Tests aborted if not completed correctly
- Contractor covers cost of retesting
- One Complete Certified Test?

FUNCTIONAL PERFORMANCE Cont.

- All items listed on checklists
- Test only after Pre-com completed
- Prove all modes of sequence/operation
- Verify all relevant contract requirements
- Start with equipment/components
  - Progress through subsystems
  - To complete systems
- Correct all failures retest w/no errors

Commissioning Team

- Contractor/QC
- Contractor/Mechanical
- Contractor/TAB
- Contractor/Controls
- Contractor/Electrical
- Designers Agent
- COR
- User/Owner

TESTING

- Mechanical System
- HVAC System

MECHANICAL SYSTEMS

- Cooling
- Heating
- Air distribution & TAB
- Controls & EMCS
- IAQ
- Energy

MECHANICAL SYSTEMS

- *Refrigeration systems*
  - *Chilled water pipe testing*
  - *Backflow prevention device*
  - *Refrigerant pipe testing*
  - *Cooling tower tests*
  - *System performance tests*
  - *Condenser water quality tests*
  - *Inspections after first year*

MECHANICAL SYSTEMS

- Hot water heating systems
  - Backflow prevention device
  - Test during winter conditions
  - Pressure test piping system
  - Operational test
  - Water treatment test
  - First year boiler/piping inspection
  - Boiler flushed and cleaned

MECHANICAL SYSTEMS

- Air supply and distribution
  - Ductwork leak test
  - Cleaning and adjusting
  - TAB
  - Performance tests
  - Field training

HVAC SYSTEMS

- Control systems
  - Start-up Test
  - Coordination with hvac balancing
  - Calibration, adjustment and start-up
  - Performance verification test
  - Posted and panel instruction
  - Training course

FUTURE WHERE ARE WE GOING?

- *100% Design Build (Transformation)*
  - *30 page RFP (No user requests)*
  - *All COE Guide Specifications eliminated*
  - *Design Review 95% (1-2 day only)*
  - *A/E responsible for QA*
  - *Delete contractor supplemental QC's*
  - *COE become Code Inspectors*
  - *Very few submittals*
  - *Build it like downtown (type 5 construction)*

FUTURE WHERE ARE WE GOING?

- *HVAC Commissioning per ASHRAE 1*
  - *States it is for Design-bid-build*
  - *Commissioning Agency is independent contractor and works for owner under separate contract*
  - *Includes other systems besides HVAC*
  - *Commissioning Agent starts at design through construction to acceptance to post acceptance commissioning*
  - *What role for COE?*

FUTURE WHERE ARE WE GOING?

- *HVAC Commissioning per NEBB,AABC, or TABB*
  - *Contractor required to hire Commissioning Agent*
  - *Increase Contract Cost*
  - *Includes other systems besides HVAC*
  - *Commissioning Agent starts at design through construction to commissioning to post commissioning (off season testing)*
  - *What role for COE?*

FUTURE WHERE ARE WE GOING?

- OVERVIEW
  - Appears that COE not responsible for quality
  - Appears COE responsible for acceptance testing
  - Since Contract oversight minimized, S&A may be reduced
  - Reduce & consolidate design sections throughout COE. Standardized RFP's, very little design review, and hardly any in-house design
  - Customer Satisfaction?

NEW BUILDING COMMISSIONING (Cx)

Gary Bauer PE

HQUSACE

202 761-0505

presented by

Dale Herron

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NEW BUILDING Cx

- QUESTION:
  - Does the Corps of Engineers perform New Building Cx for our customers on MILCON projects?

- Answer??
  - A. Yes
  - B. No
  - C. Maybe

What is New Building Commissioning (Cx)?

Cx is a quality assurance process for buildings from pre-design through design, construction, and operations. It involves achieving, verifying, and documenting the performance of each system to meet the building's operational needs within the capabilities of the documented design and equipment capacities, according to the owner's functional criteria. Commissioning includes preparing and enhancing building documentation and training operation and maintenance personnel. The result should be fully functional systems that can be properly operated and maintained throughout the life of the building. (ASHRAE, 2004)

Building Cx Association (BCA)

We define the basic purpose of commissioning as follows: *"The basic purpose of building commissioning is to provide documented confirmation that building systems function in compliance with criteria set forth in the Project Documents to satisfy the owner's operational needs."* This definition is based on the critical understanding that the owner must have some means of verifying that their functional needs are rigorously addressed during design, construction and acceptance.

NEW BUILDING Cx PROCESS

- QA process including the following phases
  - Pre-design
  - Design
  - Construction
  - Operations.
- Verify & Document performance
  - Building systems
  - Train O&M staff
  - Provide fully functioning systems

CORPS PROCESS

- **Project initiation & plan development**
  - Planning Charrette
    - Produce Draft 1391
  - Workload analysis
  - Initiate project in P2
  - Verify 1391
  - Develop Project Management Plan (PMP)
    - Establish Project Delivery Team (PDT)
      - Dev. Milestones & activities
    - Develop Acquisition Plan
    - Develop Resource Estimates
      - Request P&D funds

CORPS PROCESS

- **Design Process**
  - Advertise, Evaluate Proposals and Select A-E
  - In house pre-design activities
    - Verify project scope
    - Initial tasking & funding document
    - Pre-design conference
    - Baseline budget & schedule
    - Request & Receive funds

CORPS PROCESS

- **Project definition**
  - – Notice to proceed
  - – Design charrette
    - ECB 2002-13
    - AR 415-15
    - DA PAM 190-51
    - TI’s 800-01 & 802-01
    - ER 1110-3-1300
  - – Develop concept design
  - – Submit estimate

CORPS PROCESS

- **Project definition (Continued)**
  - Engineering Tech review
  - Construction BCOE
  - User Functional review
  - VE
  - Coordinate comments
  - Revise concept design
  - Pay A-E
  - Authorize final design

CORPS PROCESS

- **Final design & D-B RFP Development**
  - Receive directive & funds
  - Issue NTP
  - Develop final design
  - Develop source selection plan
  - Submit pre-final design
  - Prepare final RFP

CORPS PROCESS

- **Final design & D-B activities (Continued)**
  - Tech review
  - BCOE review
  - Functional review
  - Coordinate comments
    - Revise final design
  - Develop Special Clauses
    - Submit Final 3086
  - Back check
  - Ready To Advertise (RTA)

CORPS PROCESS

- **Advertising and award**
  - Authority to advertise
  - Fed Biz Oops announcement
  - Advance notice to bidders
  - Receive bids
    - Evaluate Bids
    - Conduct pre-award survey
  - Receive proposals
    - Conduct source selection
  - Develop award CWE
  - Request funds and authority to award
  - Award

CORPS PROCESS

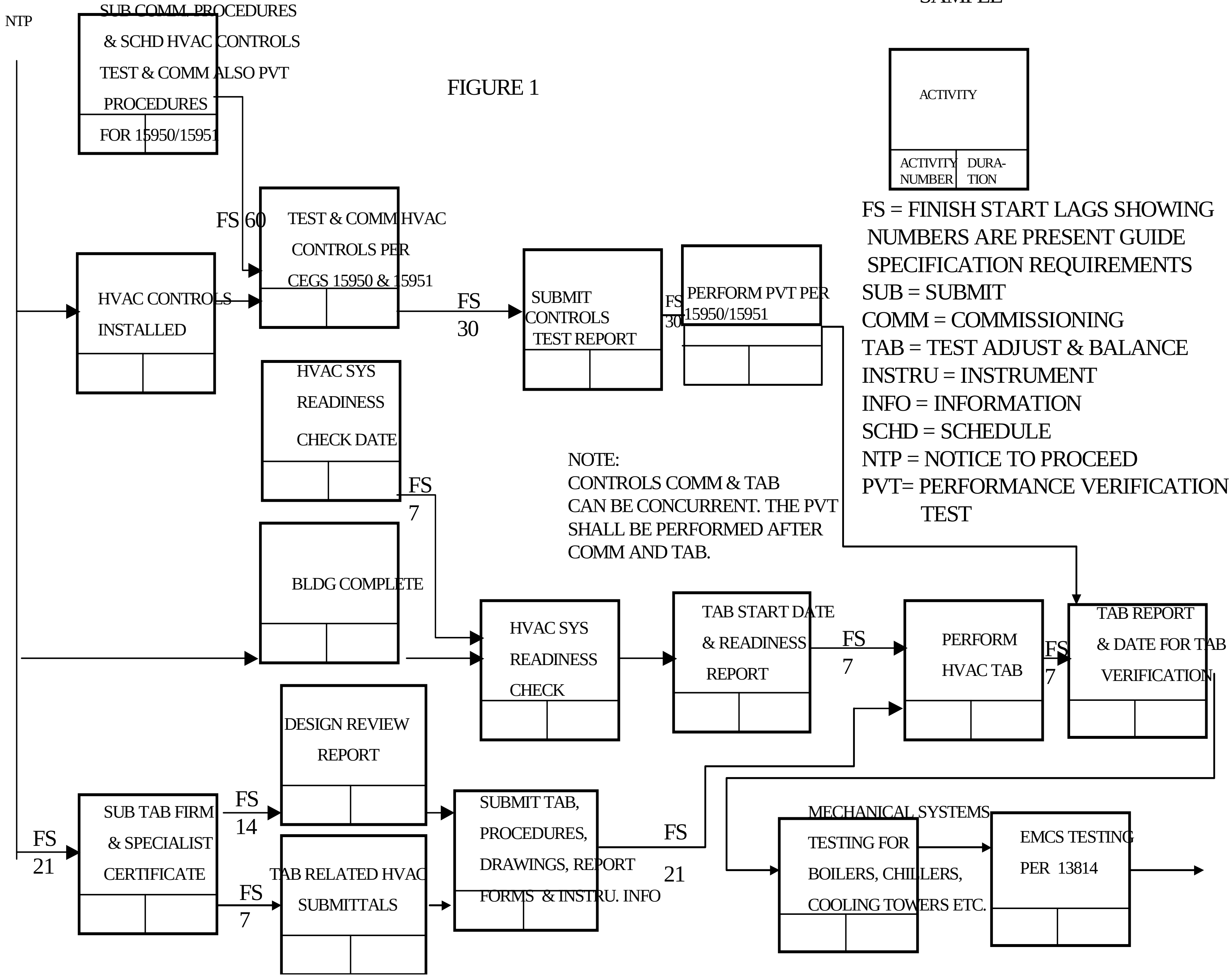
- **Construction**
  - Precon
  - NTP
  - QA/QC & safety plans
  - Schedule review and accept
  - Submittals
  - Construction placement
  - Progress payments

CORPS PROCESS

- **Construction (Continued)**
  - Process mods
  - Red zone (Performance Documented)
    - Testing complete or on schedule
    - Tab done
    - HVAC commissioning complete/on schedule
    - Test reports complete
  - Prefinal inspection
  - Punch list
  - Final inspection

SAMPLE

FIGURE 1



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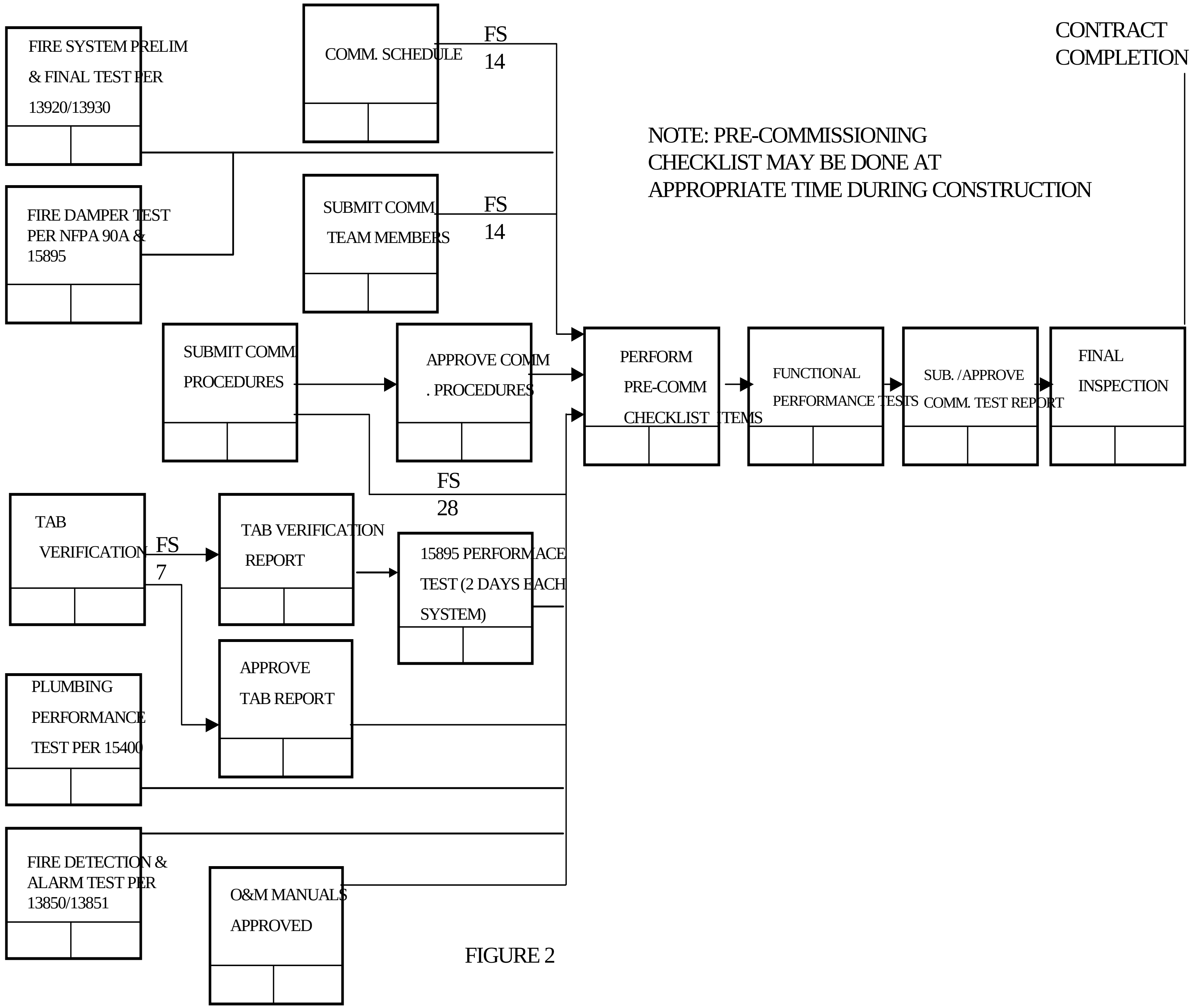
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FIGURE 2

CORPS PROCESS

- O&M & warranty
  - User O&M
    - Training complete attendance documented
    - Manuals turned over
    - As-builts complete and turned over
  - 4 month warranty inspection
  - 9 month warranty inspection

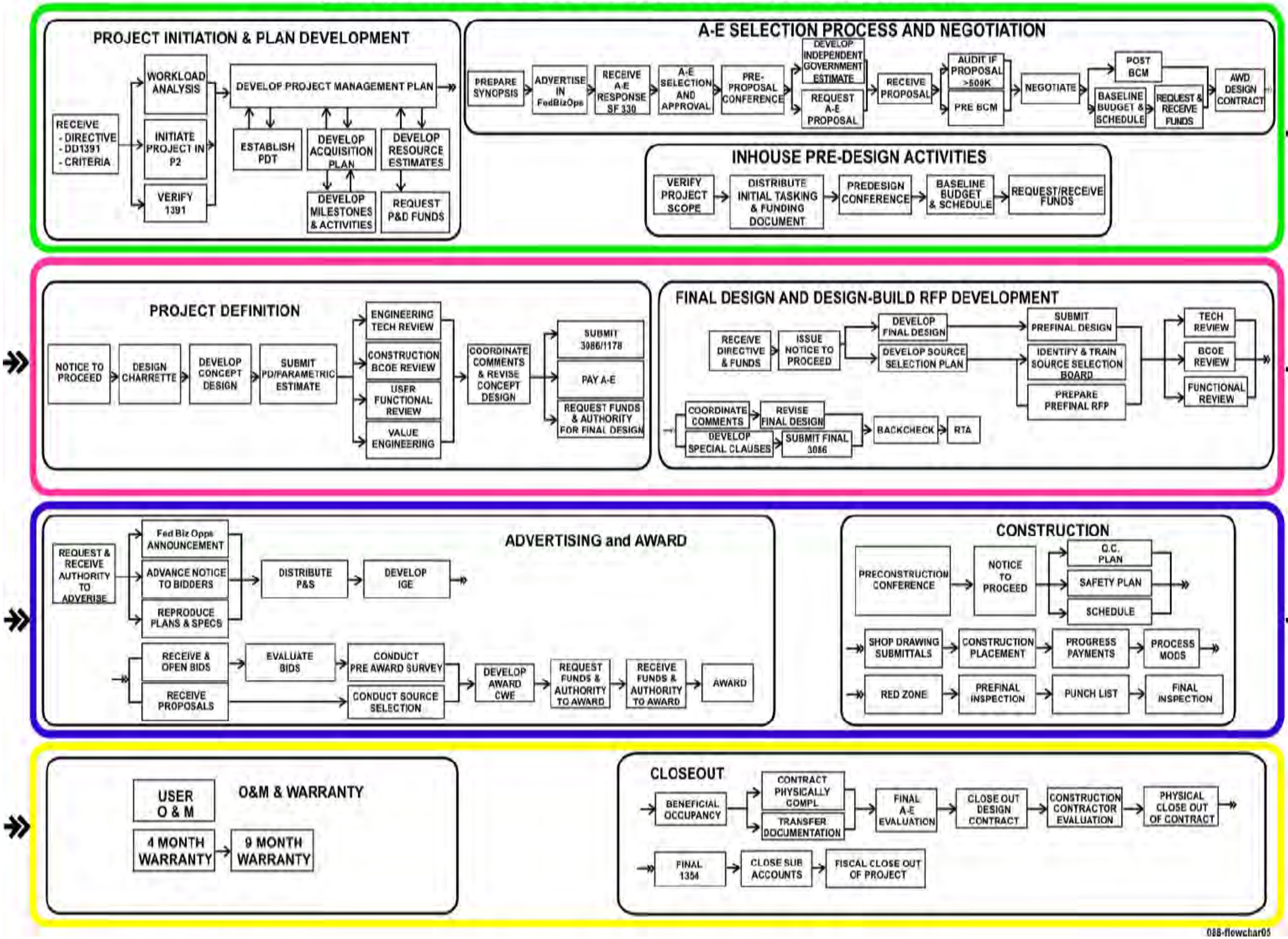
CORPS PROCESS

- Closeout
  - Beneficial occupancy
  - Physically complete
  - Transfer document
  - Final A-E evaluation
  - Close out design contract
  - Construction contractor evaluation

CORPS PROCESS

- Closeout (Continued)
  - Physical close out of contract
  - Final 1354
  - Close sub accounts
  - Fiscal close out of project

MILITARY DESIGN / CONSTRUCTION PROCESS



NEW BUILDING Cx

- QUESTION:
  - Does the Corps of Engineers perform New Building Cx for our customers on MILCON projects?
- Answer??
  - A. Yes
  - B. No
  - C. Maybe

NEW BUILDING Cx

- QUESTION:
  – Does the Corps of Engineers perform New Building Cx for our customers on MILCON projects?

- Answer:
  – A. Yes

Questions??

EXECUTION

2005 Tri-Service Infrastructure Systems
Conference & Exhibition

Technological Advances in Lock Control Systems

Presenters:

Andy Schimpf, P.E.
Electrical Engineer
St. Louis District, USACE

Mike Maher
National Automation Support Manager
Graybar Electric Company

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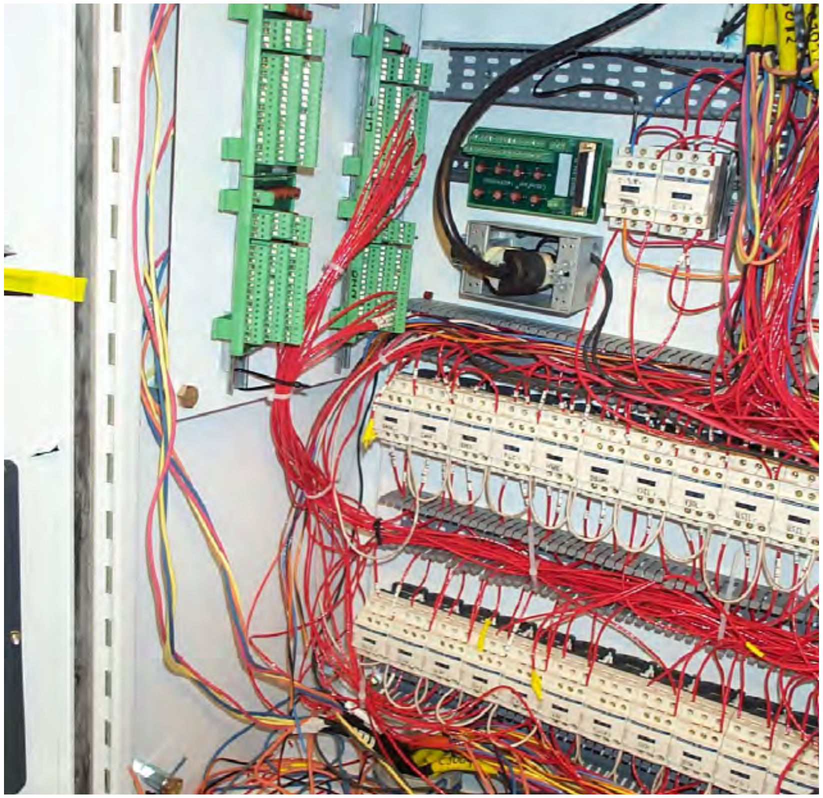

The Opportunity to Improve Presents Itself in Small AND Dramatic Ways!

St. Louis District

August 3, 2005

Graybar works to your advantage

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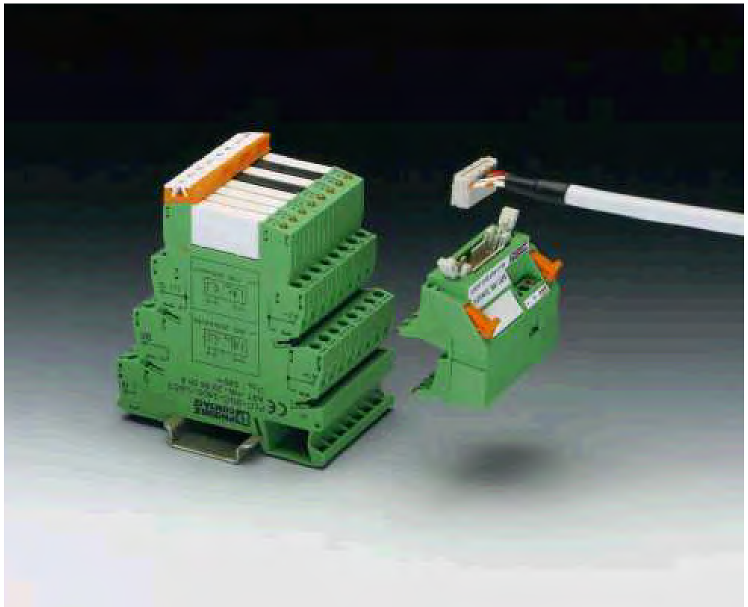

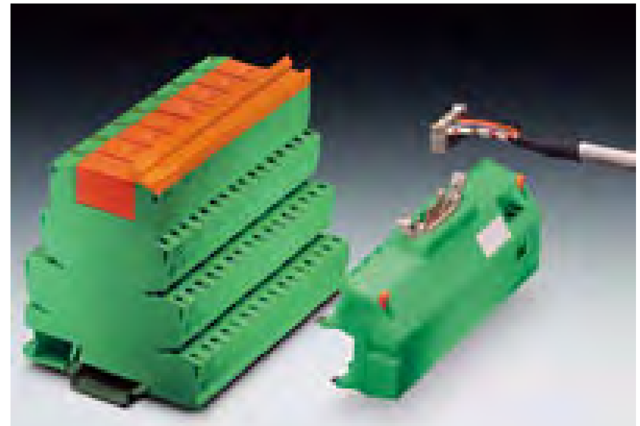

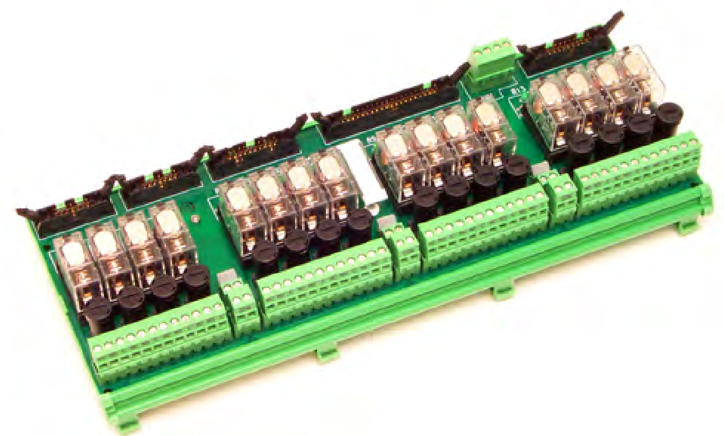

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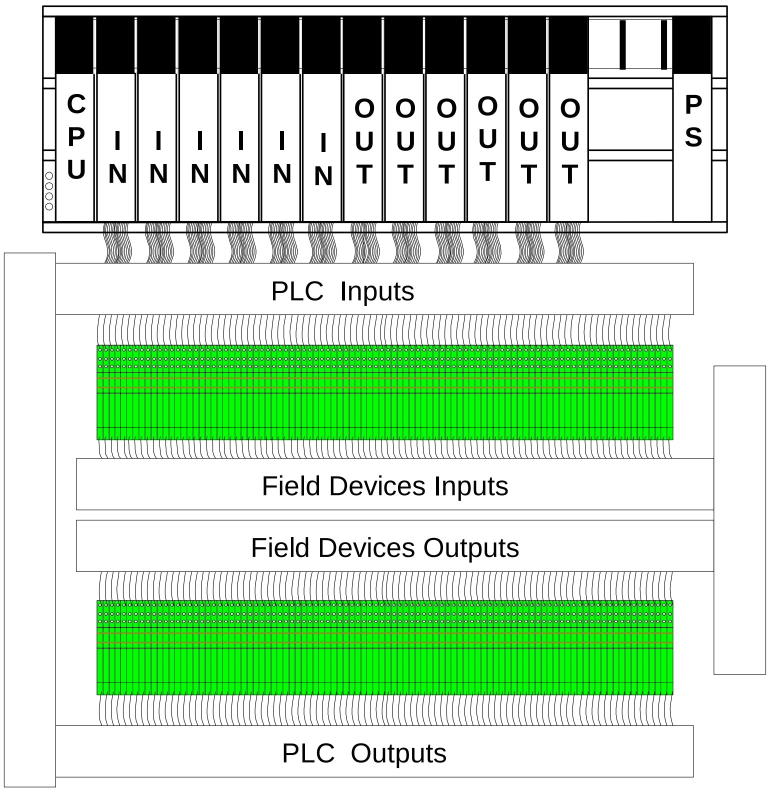
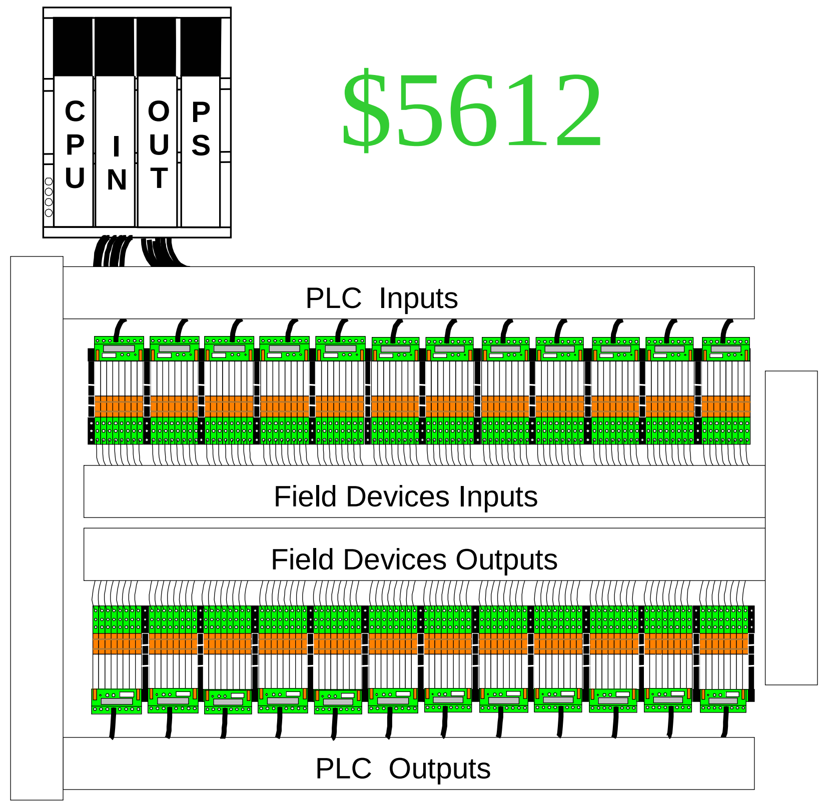
$ 12,389



$5612



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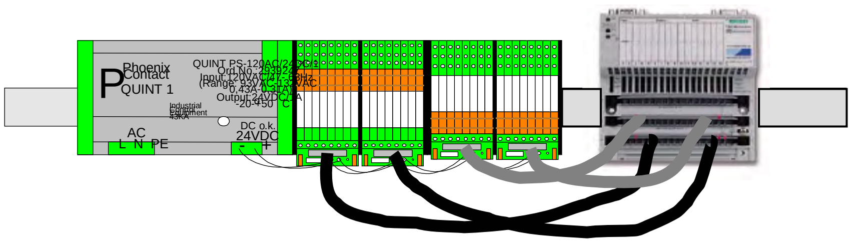
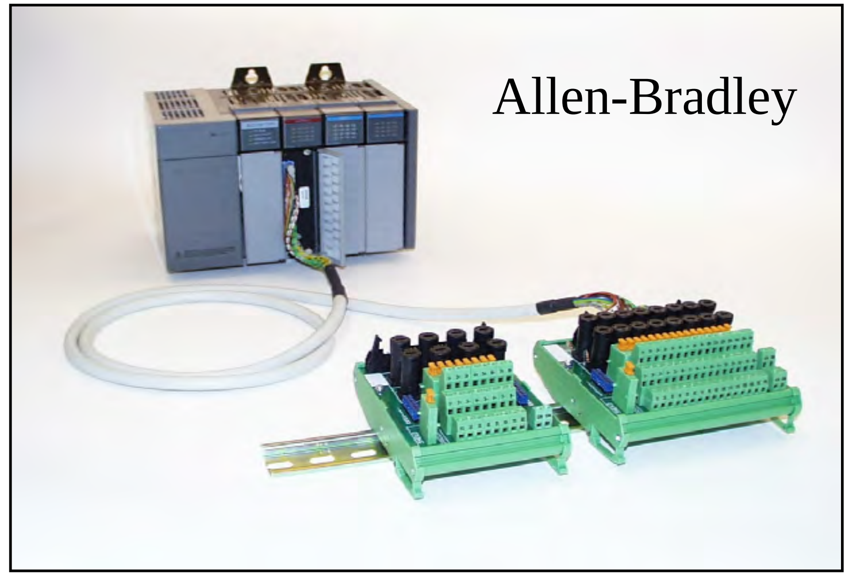
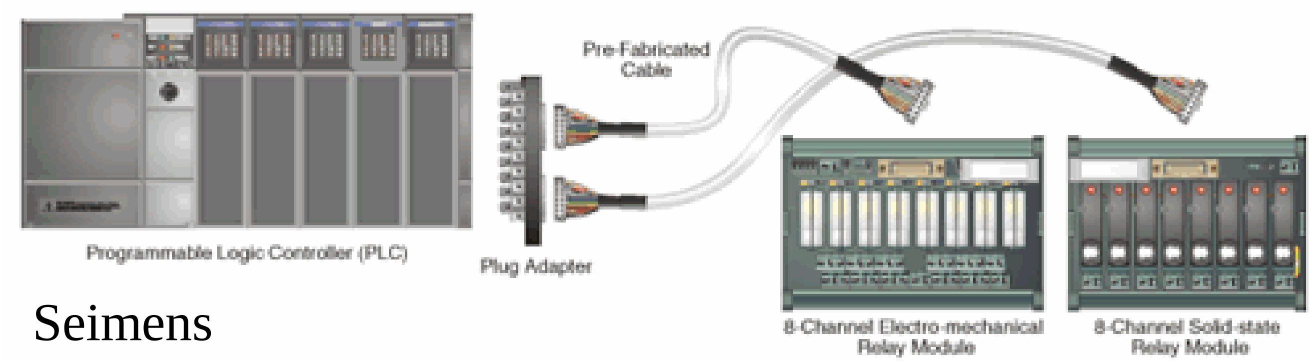
Modicon







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works to your advantage

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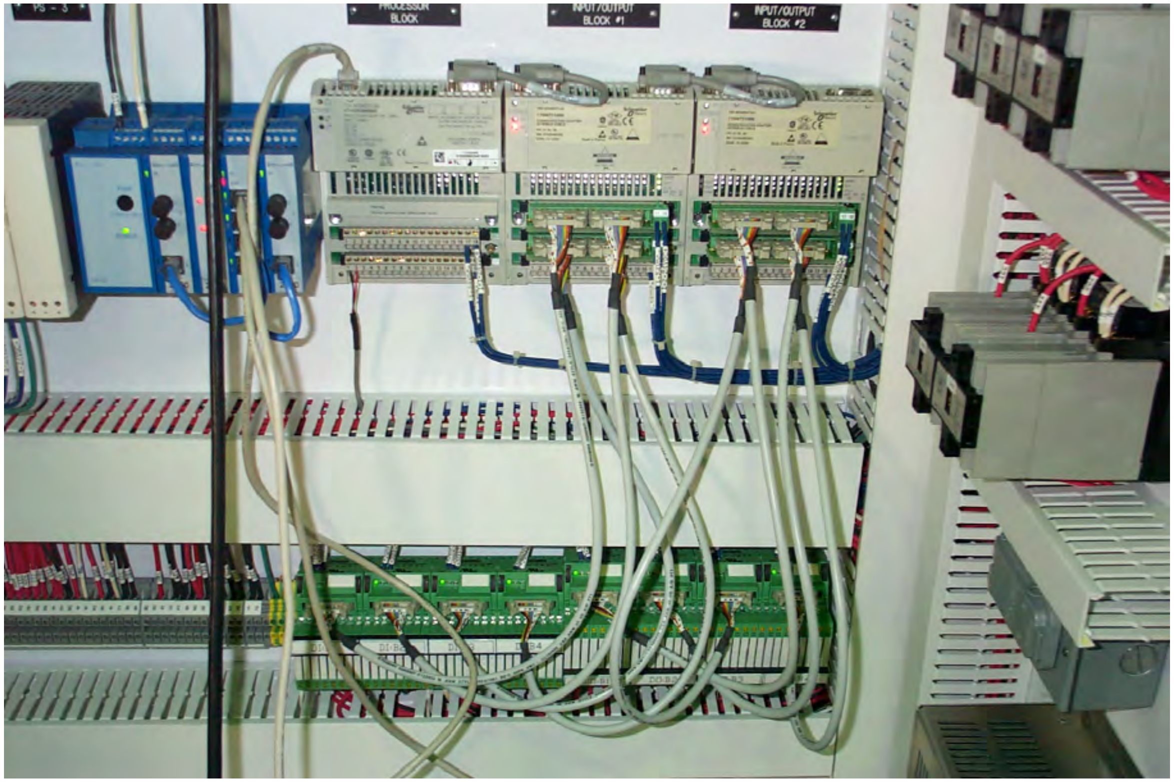

Wallisville Lock

Galveston District

August 2004

St. Louis District

August 3, 2005

GraybaR
works to your advantage

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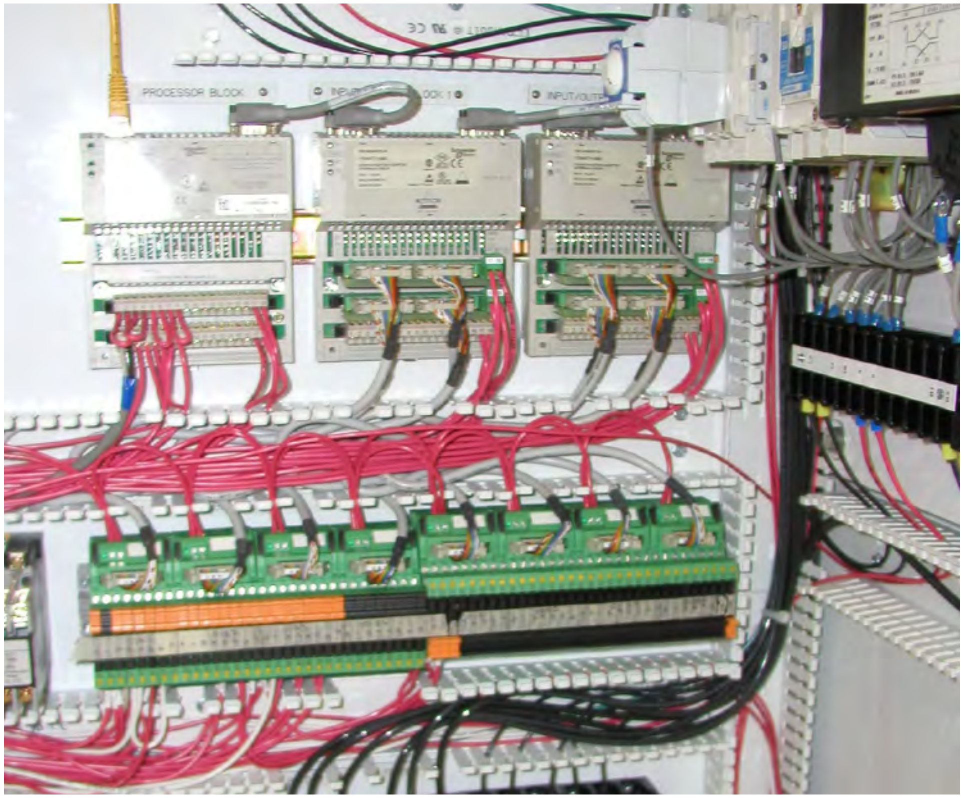


Kaskaskia Lock

St. Louis District

February 2005

St. Louis District

August 3, 2005

Graybar works to your advantage

What are the future trends?

- Embedded web pages into intelligent devices
- Lower cost Ethernet connections
- Less proprietary networks - More open Ethernet

- Remote condition monitoring
- Allowing engineering to easily support operations
- Global approach to river management
- Security through USACE WAN

Web Based Technology

Use a Common Ethernet Infrastructure From Manufacturing to MES

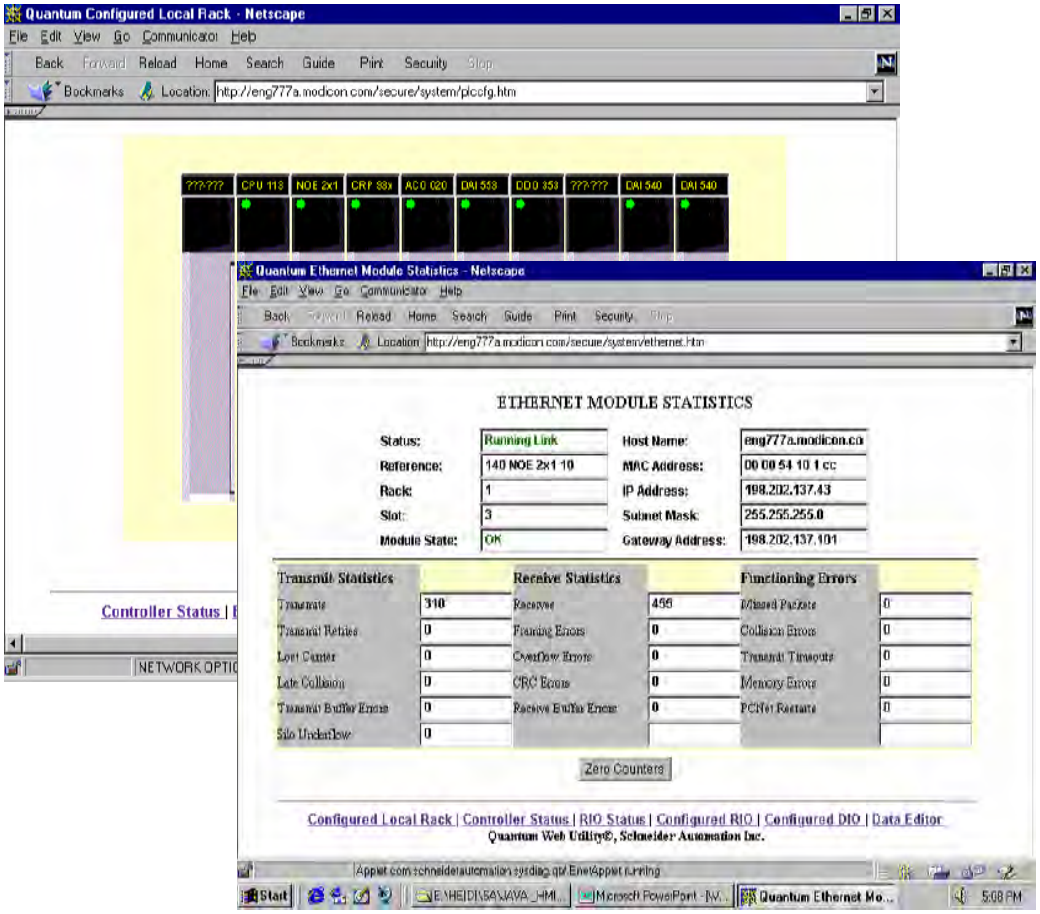
Gain Competitive Advantage Through Proven Real-time Performance

Reduce Downtime Through Web Based Diagnostics

Cut Training Costs With Everyday Tools

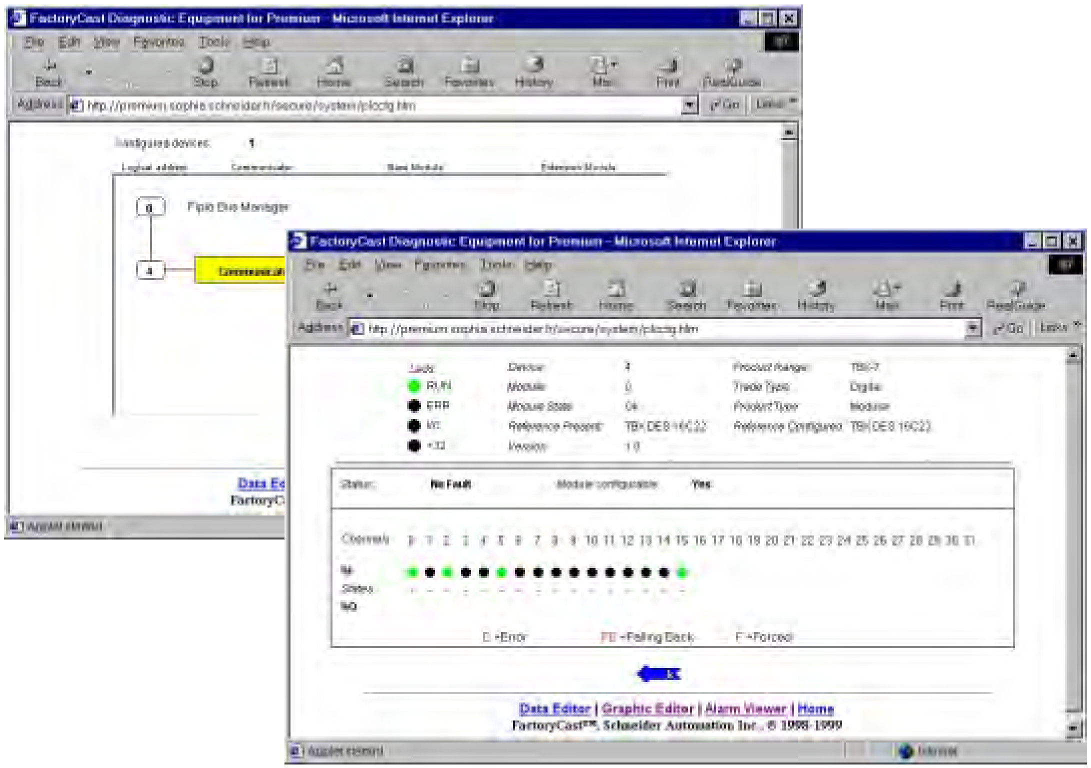
Contain Cost Through Open Standards

Web server functionalities: System Diagnostic



- **Out-of-the-box**
- **Graphical visualization of the PLC configuration**
- **Visualization of PLC defaults**
- **Detail diagnostic of each module**

Web server functionalities: System Diagnostic



- Out-of-the-box
- Graphical visualization of the remote I/Os configuration
- Visualization of module defaults

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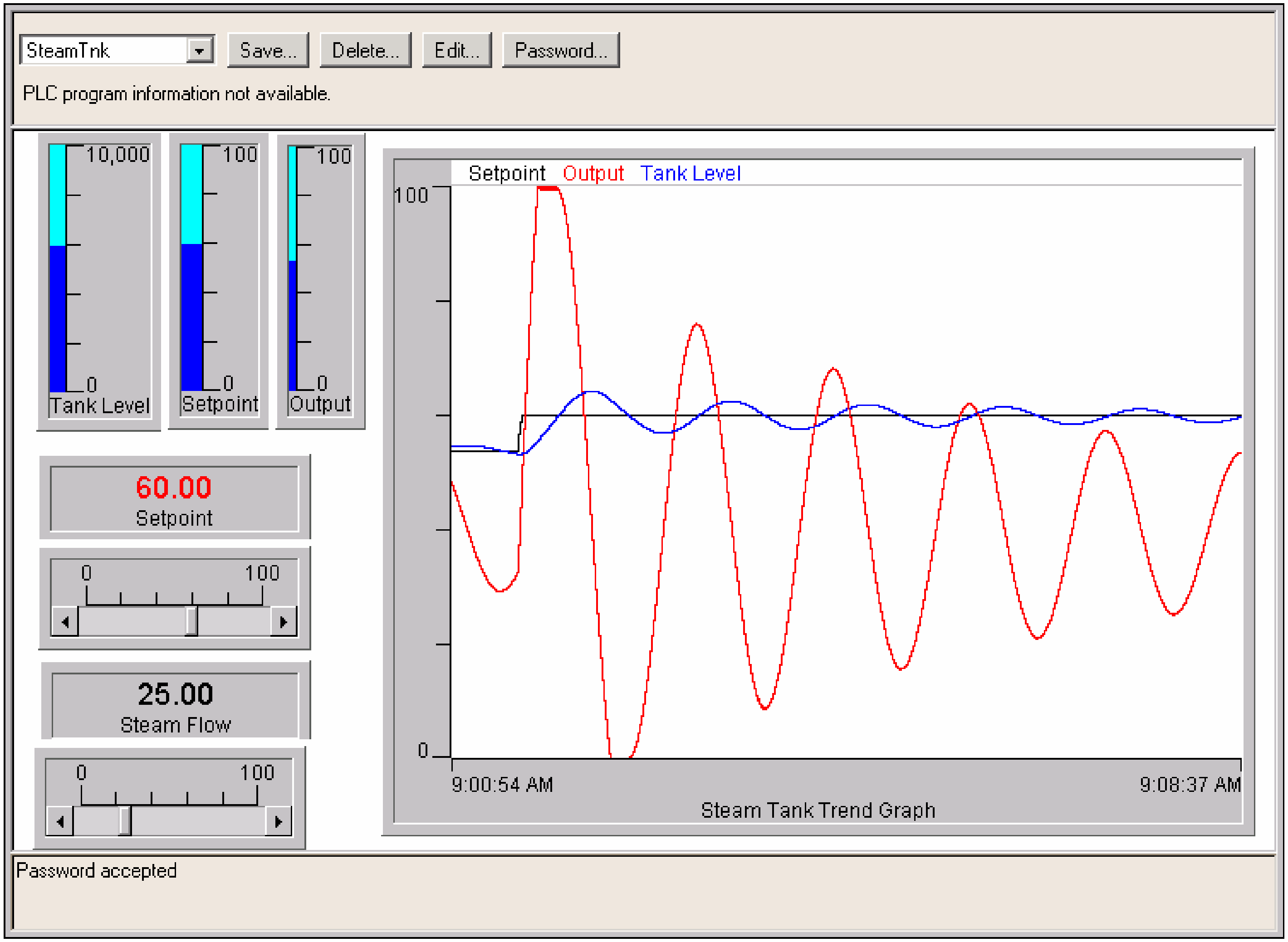


Your HMI could be a traditional panel mounted HMI PC, a laptop PC, a portable hand-held PC (PDA), or any device able to run a standard web browser software.

The Factorycast HMI web server modules essentially provide 4 main features:

1.Real-time communications (Ethernet TCPIP, Modbus or UNITE)
2.Web Diagnostics – pre-written diagnostic, adjustment, alarm management web pages for the PLC in which the module is installed
3.User Web Pages – 8MB of space for a user defined web site
4.Active Web HMI services:

•**Publisher-Subscriber protocol**

This open standard provides "many to many" deterministic communications, synchronization of distributed applications, global availability of reliable information, automatic discovery and reconfiguration, and optimized traffic load — all without the need for network programming.

Faulty device replacement

This feature permits automatic reconfiguration and network addressing of ANY faulty device, improving productivity while minimizing risks. It is incorporated into the Momentum ENT communication adapter, which sets the groundwork for future implementations in any type of industrial device.

•**Bandwidth Monitoring**

This feature allows the user to clearly determine the communication load that a device is exposed to and then tune it to achieve optimal performance, thus providing the user the critical information needed to understand and predict a device's network traffic load.

Enhanced network monitoring, web services and diagnostics

Using standard Internet protocol (SNMP - Simple Network Management Protocol) and standard Network Management Software, every FactoryCast device allows access to its enhanced Management Information Base (MIB). This not only means you can monitor the device for network performance, but you can also perform diagnostics on the operation of its services.

2005 Tri-Service Infrastructure Systems Conference & Exhibition

St. Louis District

August 3, 2005

GraybaR
works to your advantage

Instantaneous Readings

7-18-2005
11:24:05

Last Reset	Minimum		Maximum
	7:55:42 01/22/2003		7:55:42 01/22/2003

Current (Amps)	Minimum	Present	Maximum
Phase A	160	311	656
Phase B	184	315	657
Phase C	158	318	664
Three-Phase Average	169	311	659
Neutral/Residual	20	40	79
Ground	---	---	---
Apparent RMS	199	320	671

Voltage (Volts)	Minimum	Present	Maximum
Phase A-B	396	488	497
Phase B-C	371	496	500
Phase C-A	450	493	502
Three-Phase Average (L-L)	412	493	499
Phase A-N	261	282	287
Phase B-N	165	282	287
Phase C-N	258	287	290
Three-Phase Average (L-N)	239	282	288

Powers	Minimum	Present	Maximum
Real Power (kW)	124	234	468
Reactive Power (kVAR)	69	127	284
Apparent Power (kVA)	143	265	546

Power Factors	Minimum	Present	Maximum
Phase A	0.612 lag	0.872 lag	0.938 lag
Phase B	0.763 lag	0.908 lag	0.938 lag
Phase C	0.724 lag	0.875 lag	0.960 lag
Three-Phase Average Total	0.740 lag	0.850 lag	0.928 lag

Zone Summary

Zone	Zone Name	Status
1	Group 1	OFF
2	Group 2	Override ON
3	Group 3	Override ON
4	Group 4	Override ON
5	Group 5	OFF
6	Group 6	OFF
7	Group 7	Override ON
8	Group 8	OFF
9	Group 9	OFF
10	Group 10	OFF
11	Group 11	OFF
12	Group 12	OFF
13	Group 13	Override ON
14	Group 14	OFF
15	Group 15	OFF
16	Group 16	ON
17	Group 17	OFF
18	Group 18	OFF
19	Group 19	OFF
20	Group 20	OFF

Zone	Zone Name	Status
33	Sales	OFF
34	Lunch Room	OFF
35	TS Config Room	ON
36	Tech Support	ON
37	Library	Override ON
38	Finance	ON
39	Computer Rm.	OFF
40	Exec. Office A	ON
41	Reception	ON
42	Exec. Office B	ON
43	Boardroom	ON
44	Mail Room	ON
45	Exec. Office C	ON
46	Kitchen	ON
47	Exec. Office D	ON
48	Exec. Office E	ON
49	Purchasing	ON
50	Purch Office A	ON
51	Purch Office B	ON
52	Purch Office C	ON

+Monitoring
- **Circuit**
- Load Current
- Demand Current
- Power
- Energy

Circuit Summary

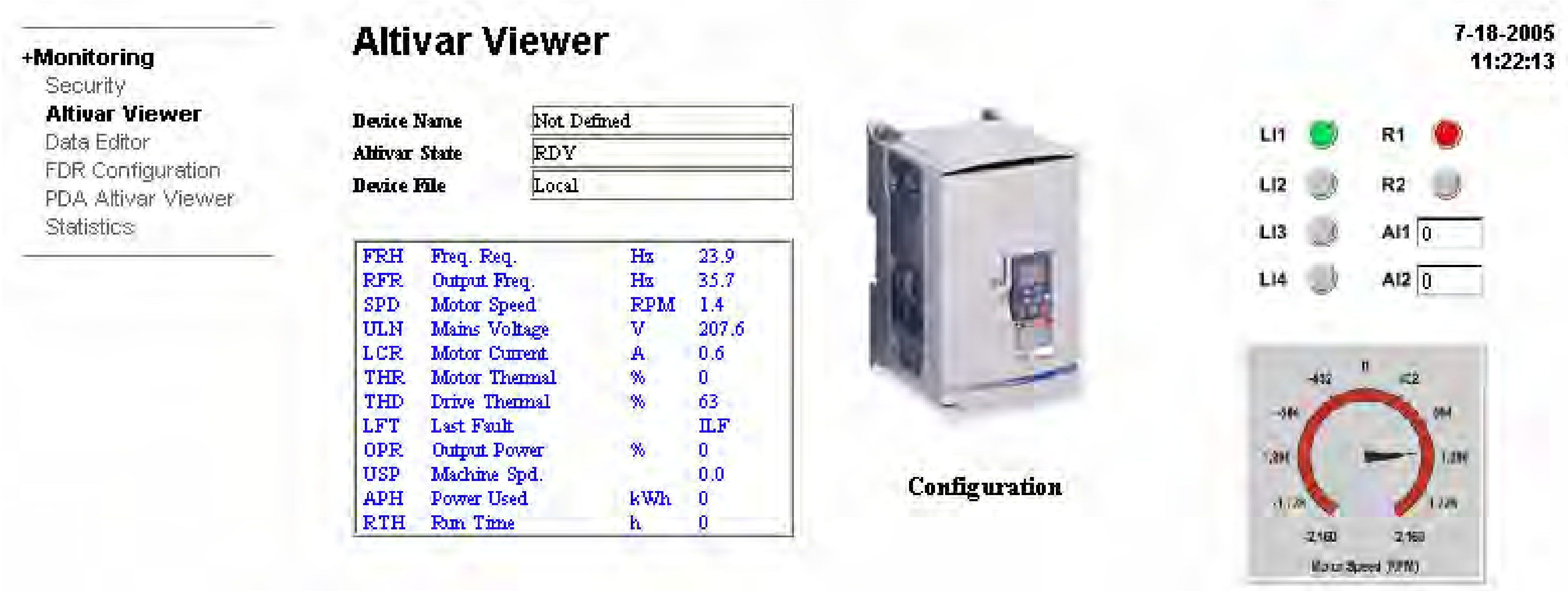
7-18-2005
11:31:42

Circuit	RMS Current (Amps) 3-phase Avg.	Thermal Capacity (%)	Drive Output Frequency (Hz)	Device Status
Main	166	42	---	on
Motor 1	65	72	---	on
Drive 1	33	100	53	on
Motor 2	64	71	---	on
Feeder 1	0	0	---	off

Load Current Summary

7-18-2005
11:32:26

	RMS Current (Amps)		
Circuit	Phase A	Phase B	Phase C
Main	165	165	166
Motor 1	65	64	65
Drive 1	34	36	35
Motor 2	66	65	66
Feeder 1	0	0	0


+Monitoring
Security
Altivar Viewer
Data Editor
FDR Configuration
PDA Altivar Viewer
Statistics
Altivar Viewer
7-18-2005
11:22:13
Device Name Not Defined
Altivar State RDY
Device File Local

FRH	Freq. Req.	Hz	23.9
RFR	Output Freq.	Hz	35.7
SPD	Motor Speed	RPM	1.4
ULN	Mains Voltage	V	207.6
LCR	Motor Current	A	0.6
THR	Motor Thermal	%	0
THD	Drive Thermal	%	63
LFT	Last Fault		ILF
OPR	Output Power	%	0
USP	Machine Spd.		0.0
APH	Power Used	kWh	0
RTH	Run Time	h	0

Configuration
LI1
R1
LI2
R2
LI3
AI1 0
LI4
AI2 0
Motor Speed (RPM)

QUESTIONS?

Lightning Protection Standards

Richard Bouchard

- Employed With UL for 24 Years
- Technical Advisor for UL’s Lightning Protection Services
- Member of NFPA 780 Technical Panel
- Certification for Residential Building Inspector to the International Building Code for Single and Multi Family Dwellings Pending

Objectives

- Standards Actively Used Design and Inspection
  - NFPA 780
  - UL 96A
  - UFC 3-570-01
  - AFMAN 91-201
  - NAVSEA OP-5, Vol. 1
  - DA Pamphlet 385-64
- First Three Used for Ordinary Buildings
- Last Three Referenced for Ordnance / Explosive Facilities

Standard Used for System Design

- NFPA 780
- UFC 3-570-01

Standard Used for System Inspection

- UL 96A

Relationship Between the Standards

- NFPA 780
  - Base Document Used by UFC 3-570-01 & UL96A
  - UL96A Designed to Meet All the Min Requirements
  - UFC 3-570-01 Provides Guidance for Areas Not Covered in NFPA 780
- UL96A
  - Intended As an Inspection Standard
  - Defined Requirements
  - Less Interpretations.

Relationship Between the Standards

- UFC 3-570-01
  - Unified Basic Requirements Between Service Branches
  - Expansion of Requirements for Special Types of Structures
  - Guideline Requirements for Ordnance / Explosive Facilities

Major Differences Between the Standards

- UFC 3-570-01 & NFPA 780
  - Section 5-3 refers to NFPA 780 Appendix H for risk assessment to identify structures not needing coverage.
  - 5-4.1 Capped air terminals are not permitted.
  - 5-4.1.2 Air Terminals gives specific distances for exhausting hazardous vapors
  - Air terminals installed on “rubber” (EPDM) type roofs

Major Differences Between the Standards

- UFC 3-570-01 & NFPA 780
  - 5-4.1.3 Conductors.
    - Bolted Connections Are Not Allowed on the Roof and Down Conductors.
    - Roof and Down Conductors Shall Be Exothermically Welded or Shall Use High Compression Fittings
  - There Are No Listed High Compression Fittings Listed by UL for This Application.
  - 5-4.2 **Mast System.**
    - The down conductors need to be protected from grade level to a point 3 m (10ft) above grade.

Major Differences Between the Standards

- UFC 3-570-01 & NFPA 780
  - 5-4.2.7 Joint Design.
    - Not covered in NFPA 780
  - 5-4.2.8 Joint Test.
    - Not covered in NFPA 780
  - 5-4.4 Faraday Shield System.
    - Not covered in NFPA 780
  - 5-5 NONCONVENTIONAL SYSTEMS**.**
    - Dissipation Arrays and Those Using Early Streamer Emission Air Terminals Are Not Acceptable and Are Not Be Used.

Major Differences Between the Standards

- UFC 3-570-01 & NFPA 780
  - 5-6.2 Bonding Installation Guidelines For Design And Construction.

    Basic Requirements for Bonding of LPS Are in AFI 32-1065 and NFPA 780.
  - 5-7.1 Ground Resistance.
    - Not Covered in NFPA 780 With a Specific Value but Techniques.
  - 5-7.2
    - Plate Electrodes Is Discouraged

Major Differences Between the Standards

- UFC 3-570-01 & NFPA 780
  - 5-10.2 Reinforced Concrete Buildings.
    - Reinforcement Steel May Be Used for Down Conductors, in Conformance With NFPA 780. This Is Not Allowed in NFPA 780
  - 5-10.3 Steel Frame Building With Non-conducting Roof and Sides.
    - At Least One Steel Column Must Be Grounded at Each Corner of the Building.
  - 5-10.4 Through 5-10.6
    - Installation Techniques Not Covered in NFPA 780

Major Differences Between the Standards

- UFC 3-570-01 & NFPA 780
  - 5-10.9 Post Tensioning Systems.
    - The Post Tension Rods Shall Not Be Used As a Path for Lightning to Ground.
  - 5-10.10 Through 5-10.20
    - These Cover Special Types of Ordinary Structures

Questions

Thank You for Attending

Corps of Engineers in Iraq

Rebuilding Electrical Infrastructure

by Hugh Lowe

What’s it like?

- Have you ever reached up to scratch your ear and your ear lobe felt rough and scaly like alligator skin?
- Have you walked out after lunch and the hot wind felt like holding the hair dryer straight at your face about six inches away with the temperature set on high?

What's it like?

- Do you usually dump your shoes in the morning or look under the bed covers before getting in at night to check for scorpions, camel spiders, gademas or vipers?
- Do about half the guys you work and live with carry AK-47's and have an RPG launcher stashed back in their room in case the situation gets touchy? If so, then you have some idea of what its like to live in Iraq.

Why go to Iraq?

Could it be for the scenery?

Why go to Iraq?

- People have asked me why would you ever want to go to Iraq?
- My son thought I was crazy
- . My wife told me I should rethink my decision.
- My co-workers looked at me like I had really gone off the deep end this time.

So, why go?

- So why would I go to Iraq?
- I felt like I supported the President's decision to change the regime there and that now I owed a debt to the ordinary Iraqi citizen to help put their country back in order.
- I felt like I had the skills and experience that would be useful in this country where the electrical infrastructure had been decimated.
- As a student of the Bible, I wanted a chance to possibly see the ancient city of UR where Abraham was raised, or to see the site of the Garden of Eden.

Why go?

- Jeremiah 29: 10
- The truth is this: You will be in Babylon for a lifetime. But then I will come and do for you all the good things I have promised, and bring you home again. For I know the plans I have for you, says the Lord. They are plans for good and not for evil, to give you a future and a hope.

Abraham’s monument at Ur

Obligatory Camel Photo

Camel Spider

Obligatory Cleric Billboard Photo

Not the UGLY Truck


SOUTHWEST CHARTER LINES
Ryder

Fort Bliss, TX Firing Range

Frankfort, Germany

Camp Wolverine, Kuwait

Basrah International Airport, Iraq

Basrah International Airport, Iraq

My new branch chief said -

- I’m sending you to
- Buzurgan
- You’re going to love it.

Amarah

Irrigation Project

Heat Problems in Iraq?

Buzurgan

Buzurgan to Amarah 138-kv

Buzurgan to Amarah 138-kv

Buzurgan to Amarah 138-kv

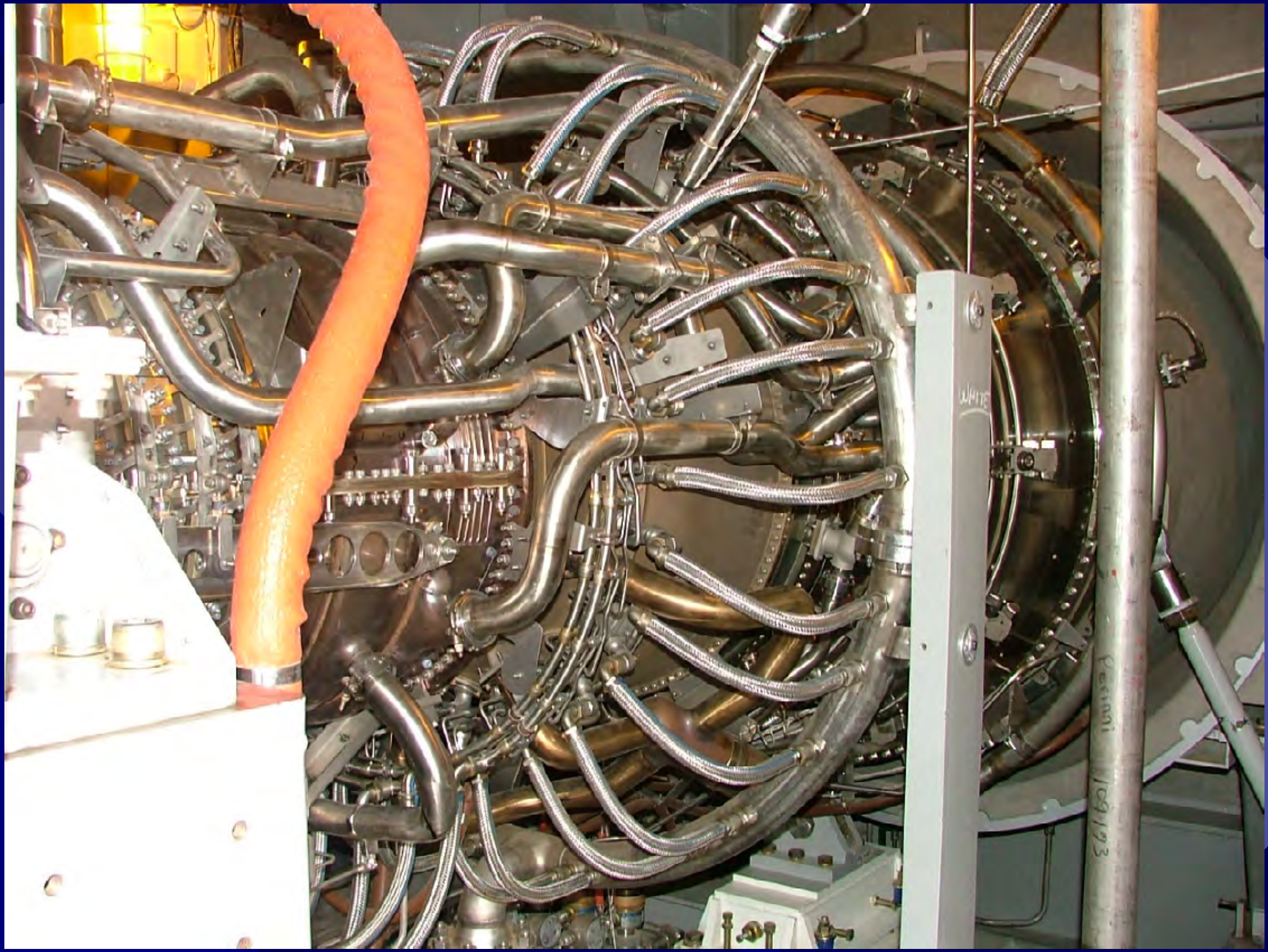
Buzurgan to Amarah 138-kv

Buzurgan to Amarah 138-kv

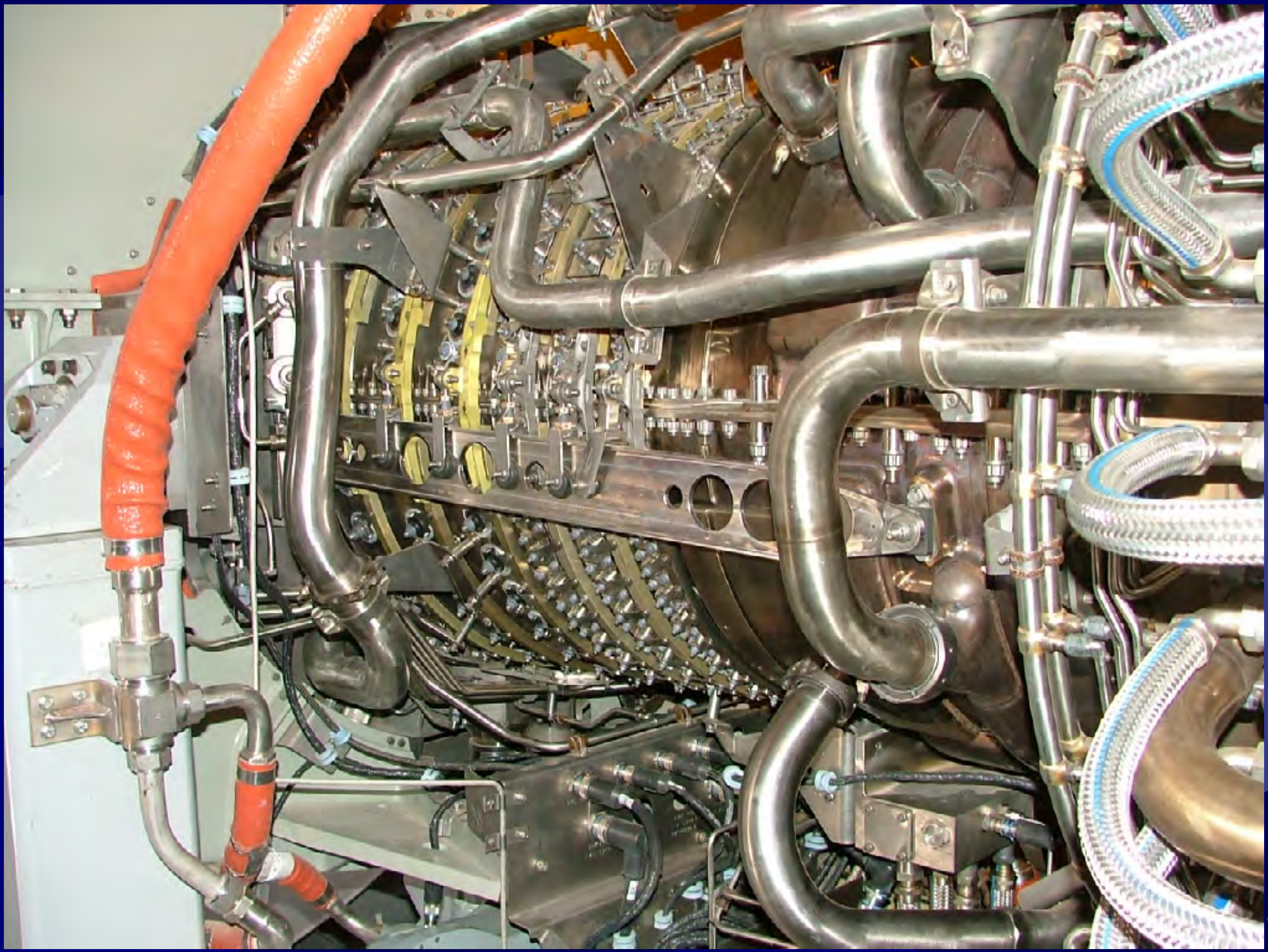
Buzurgan Electric Generating Station

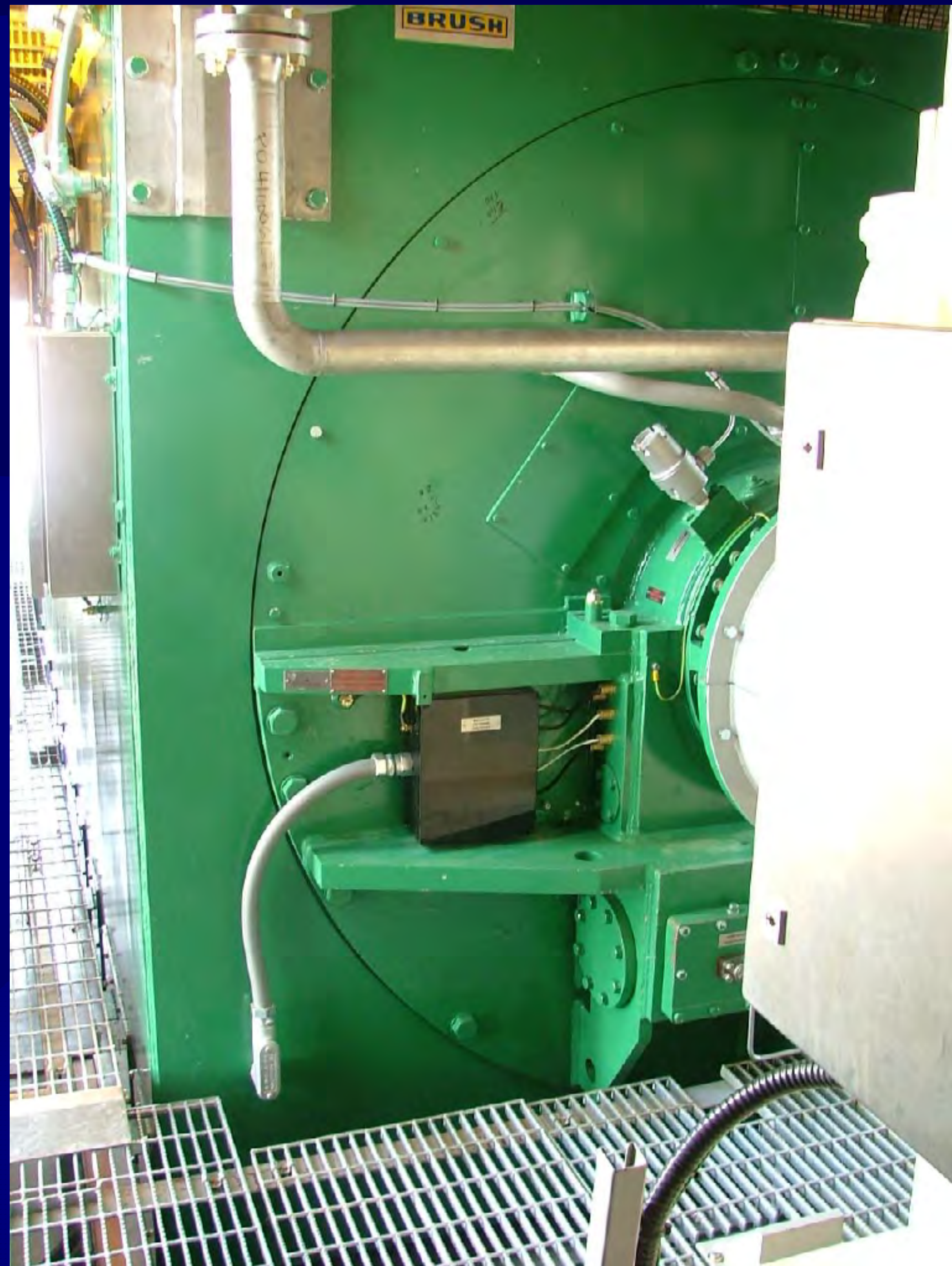
Buzurgan

Buzurgan



Buzurgan




BRUSH

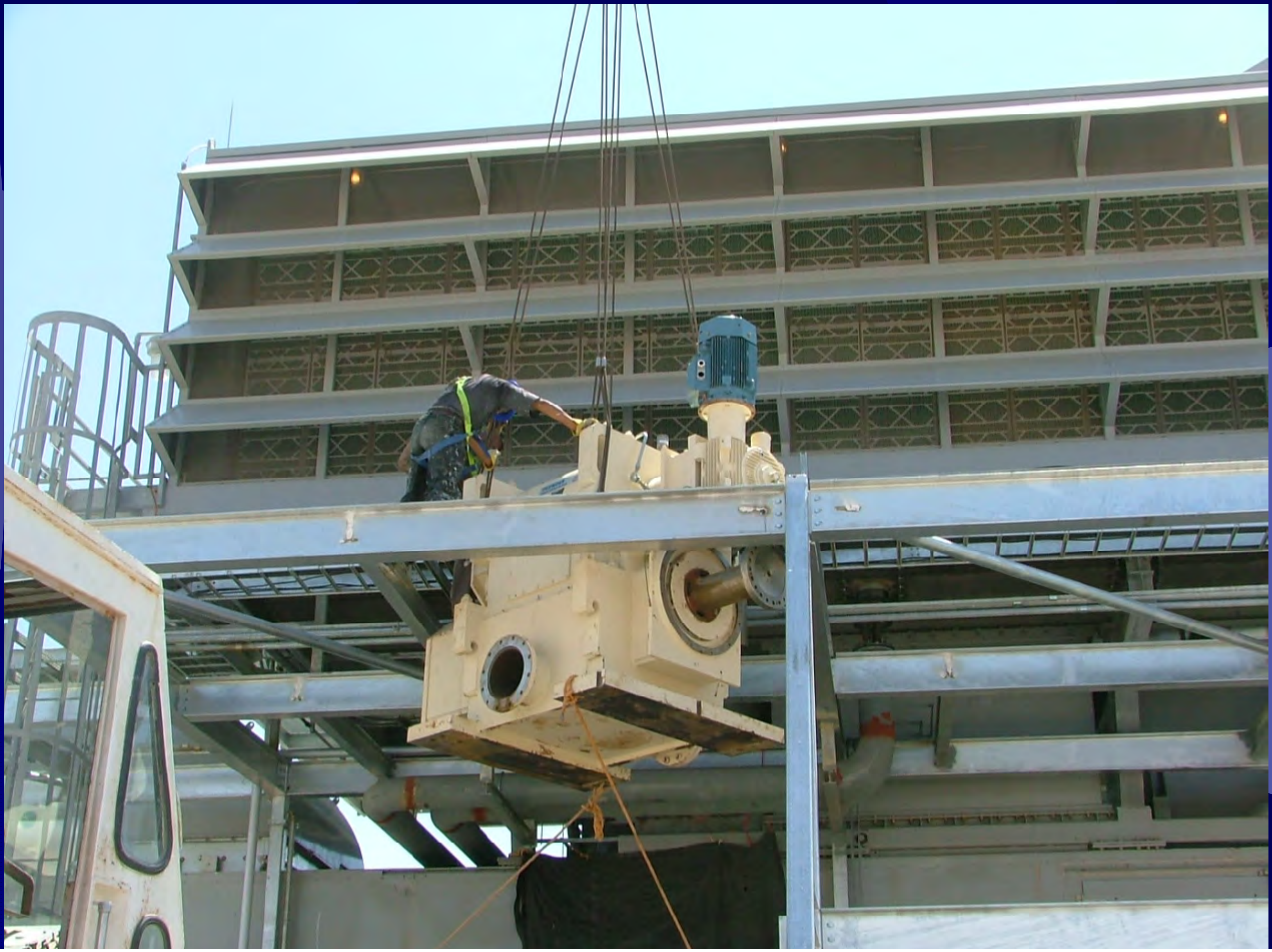
Buzurgan

Problems

- Gear Box
- Transmission voltage: 100-150 kv
- Relay wiring errors
- Inadvertent input to relays
- Vibration at the generator input shaft
- Sabotage to the oil industry
- Relays installed in outdoor cabinets
- SF-6 circuit breakers
- Personalities
- Ethics of Iraqi contractors
- Gas Compressor motor overheated

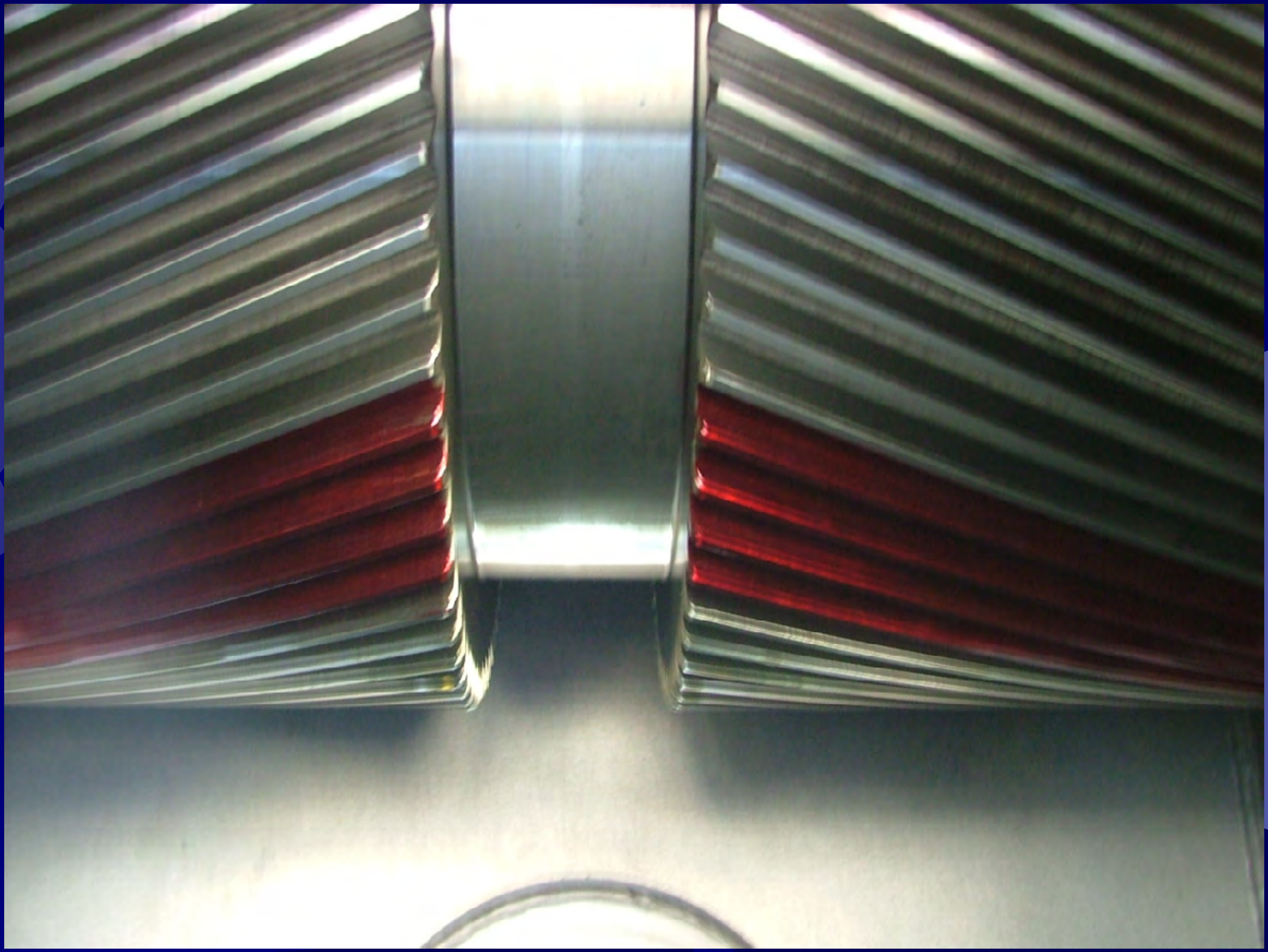
Buzurgan Gear Box

Gear box install

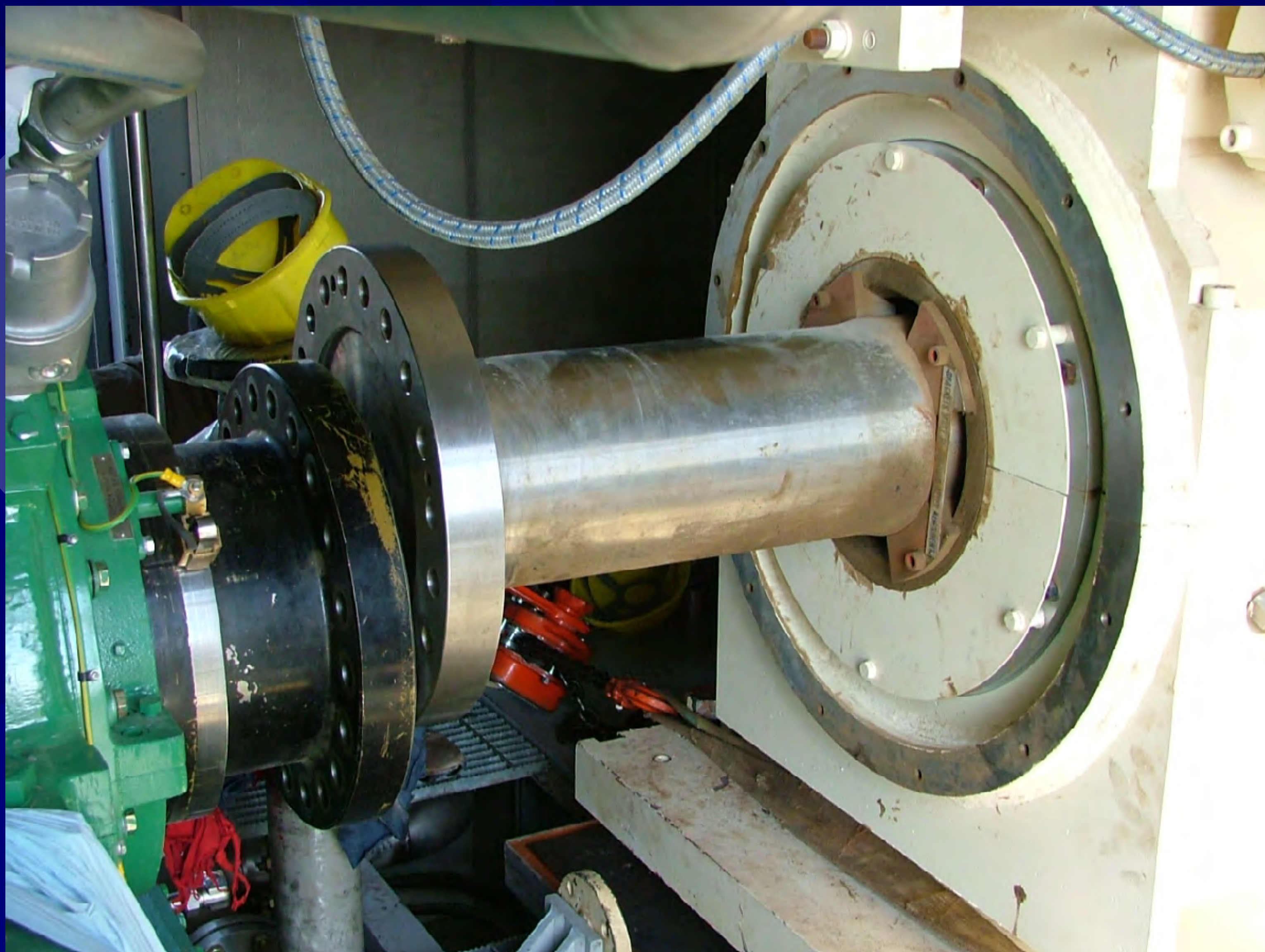


Sliding gear box into package

Ooops



We've got a long way to go before we get alignment



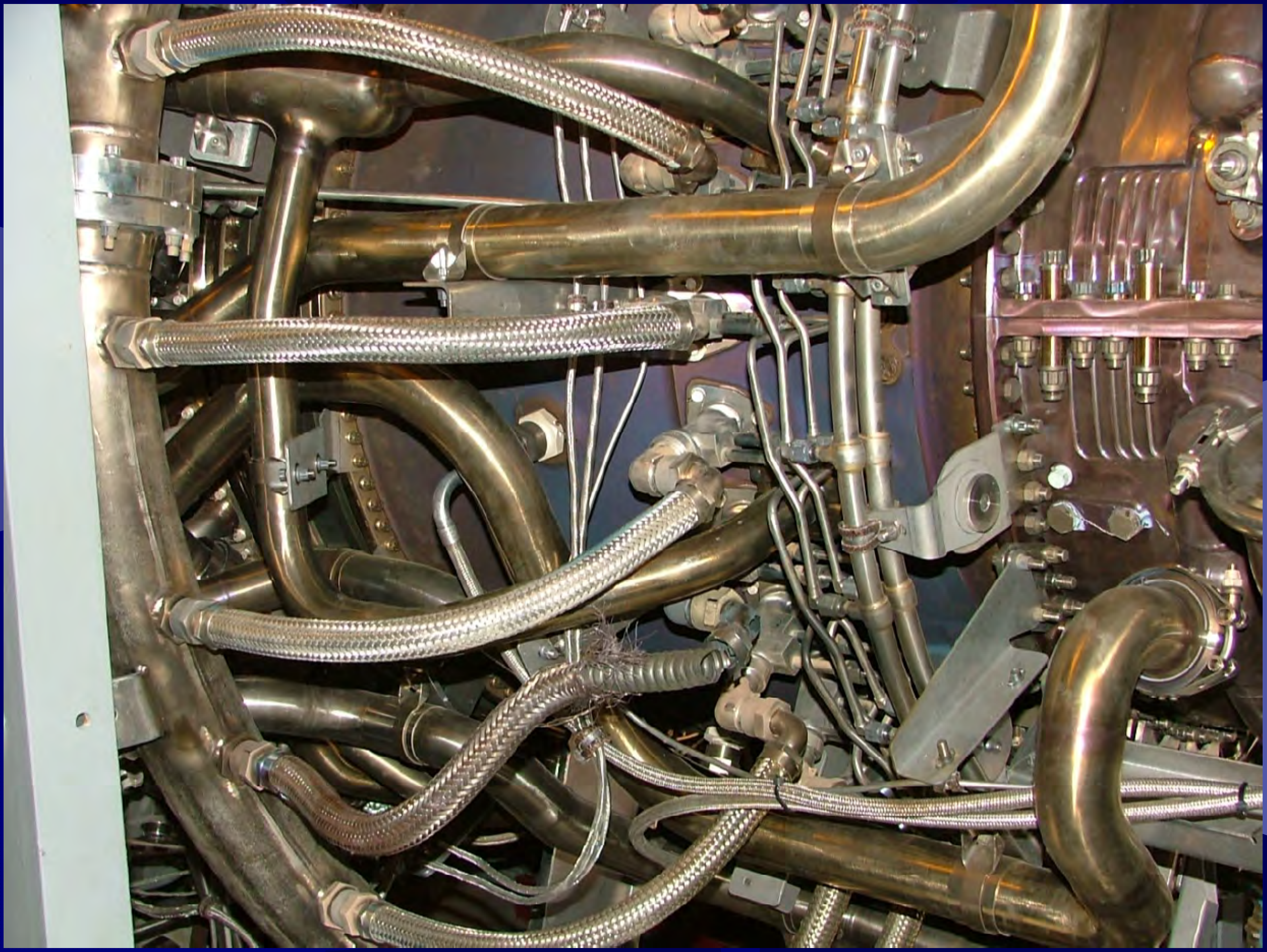
Nobody told us---

Gear box alignment

Having this clearance saved a lot of sheer tubes.

Gear Mis-match

BANG



Dual fuel nozzles

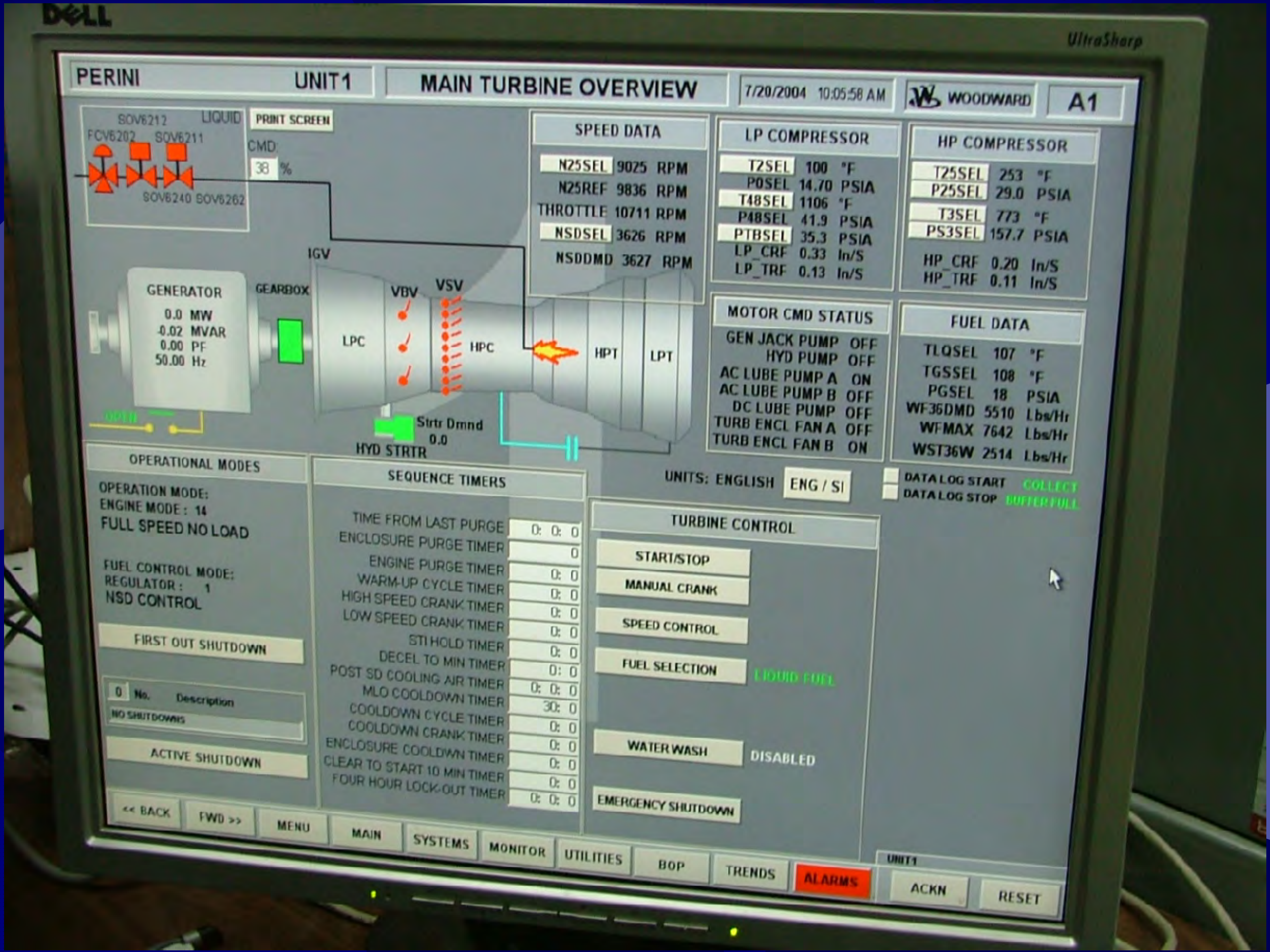
Chillers to cool combustion air

Top view of chiller banks

Air Filter and Heat Exchanger

Tank farm for water & diesel fuel

PLC Control Screen



Gas Compressor Motor

2000-HP Motor toasted

Gas compressor motor bearing

- Discoloration on the shaft.
- Babbit Debris

Nasiriyah

Nasiriyah – Let’s see if we damaged anything by defeating the four-hour lock out!

Houston – I think we have a problem

Uh-oh

Do you think there's anyway to cover this up?

On line and producing power

International effort

Buzurgan

Thank Heaven for Concrete Roof

In spite of the problems, we had some fun

Iraqi Desert Fox

Smoking the water pipe

Nimrod crew

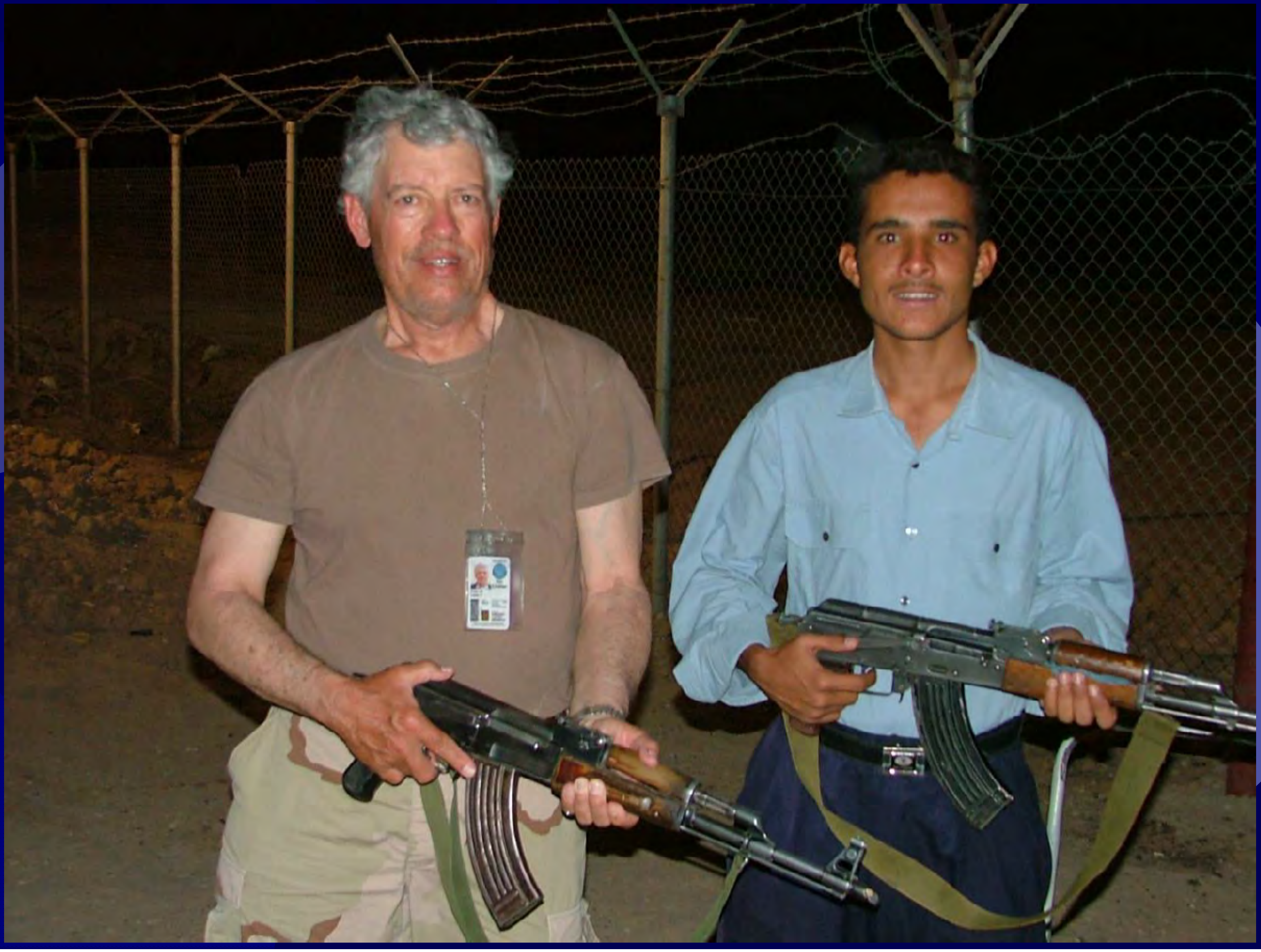
Brits meet with Ministry of Electricity

Kids: The Future of Iraq

Needing a helping hand

Southern Oil Company Poster

Insurgency suppression team



Ackmed and Hyter guarding our camp

Family Photo

29 June 2004

Iraqi Freedom Day

Appreciation!

Questions?

Acoustic Leak Detection for Water Distribution Systems

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Overview

- Requirement, Background
- Technical Overview of Acoustic Leak Detection
- Army Facility Testing
- Permanently Mounted Sensor Demonstration

Requirement / Problem

- Originally developed to detect fuel leaks
- EQ STRAT REQT: Compliance 2.111.2.00 Improved Leak Detection and Prevention Technologies for Underground Storage Tanks (UST) and Underground Pipeline
- EPA Requirement:
  - Annual tightness test
    - Detecting a leak as small as 0.1 gal/hr
    - Probability to detect 95%
    - Probability of false alarm 5%
  - Monthly monitoring test
    - Detecting a leak as small as 0.2 gal/hr

Early DEM/VAL of Acoustic Emission Technology

- EPA - SERDP Testing
- **Army Testing Systems:**
  - Hydrant Lines,
  - Heat distribution high temperature conduit pipe system
  - Deluge fire protection pipelines
  - Dual temperature heating and cooling
  - PVC fire hydrant supply
  - Domestic potable water

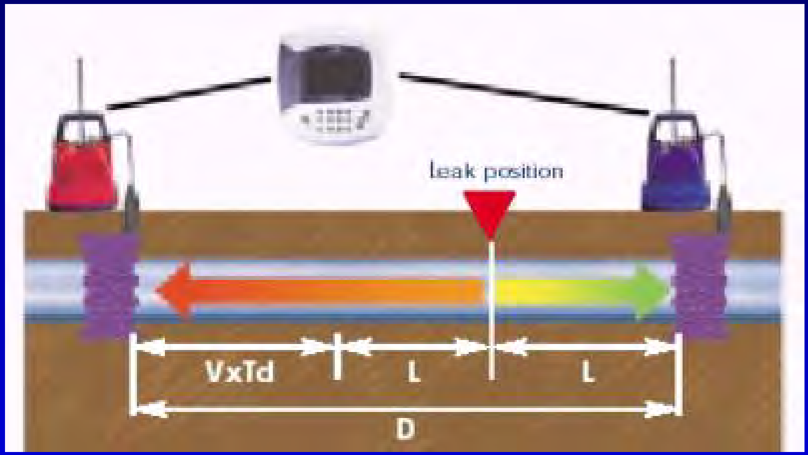
Technical Overview

Acoustic Listening Equipment

US Army Corps
of Engineers

Engineer Research and Development Center

Leak-Location Through Acoustic Correlation



The correlation formula

$$L = \frac{D - (V \times Td)}{2}$$

A correlator works by detecting the sound from the leak when it arrives at two sensor points on the pipe, either side of the suspected leak position. The sound arrives at the closer of the two sensors first; then there is a "time delay" (Td) before the sound arrives at the farther sensor. This time delay, combined with knowledge of the distance (D) between the sensors and the velocity (V) of the sound in the pipe, enables the correlator to calculate the leak position (L)

Types of Sensor Mounting

- Acoustic Leak detection on operating HTW double walled pipelines
- Developed simple, generic field method of mounting sensors to carrier pipe
- Waveguide needed due to high surface temperatures of carrier pipe

Types of Sensor Mounting

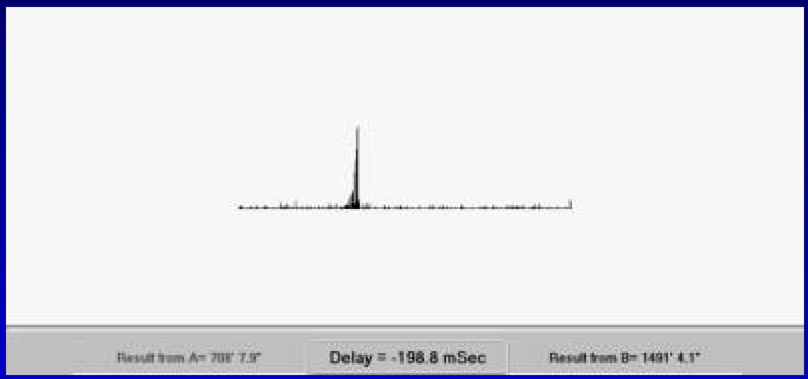


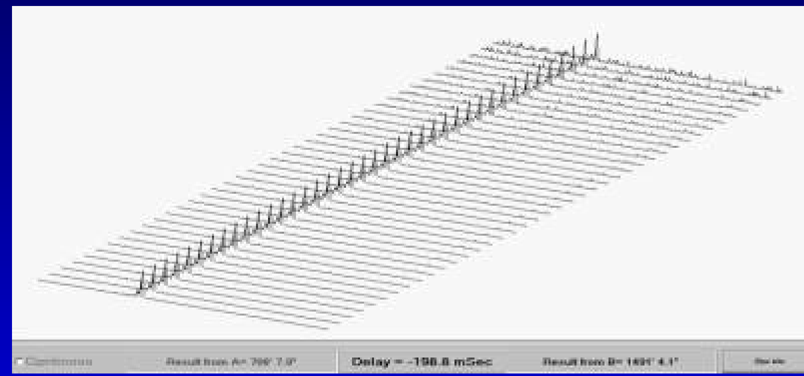

US Army Corps
of Engineers

Range of Application

- Useful on carrier lines with many purposes
  - Underground heating
  - Cooling
  - Fire Suppression/Deluge
  - Potable water
- Useful on material compositions
  - Ferrous
  - Copper
  - Transite
  - Bondstrand

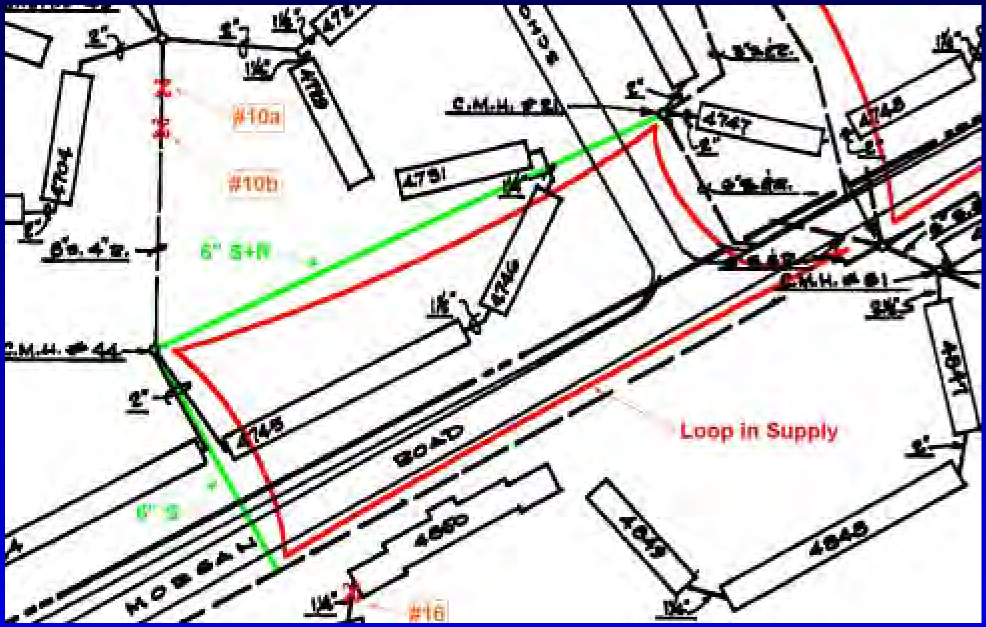
Pinpointing Location Through Noise Reduction Algorithms





Dual Temperature Heating and Cooling System Leak Survey

Dual Temperature System



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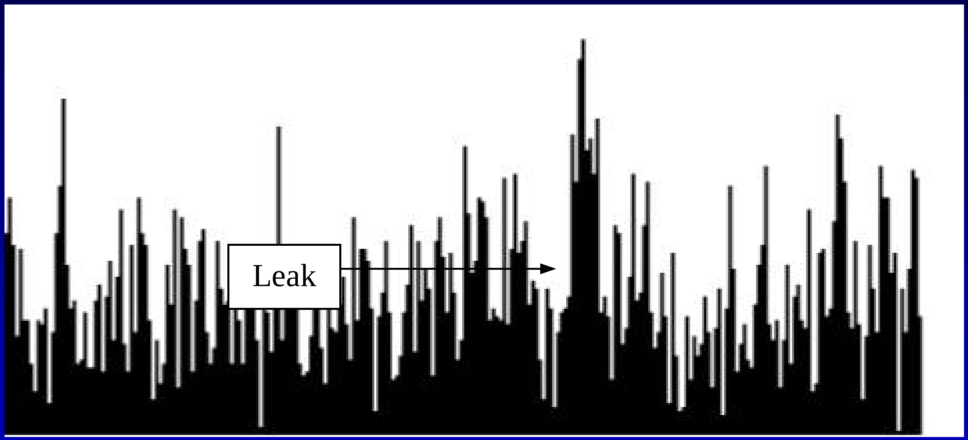
of Engineers

Engineer Research and Development Center

Dual Temperature System



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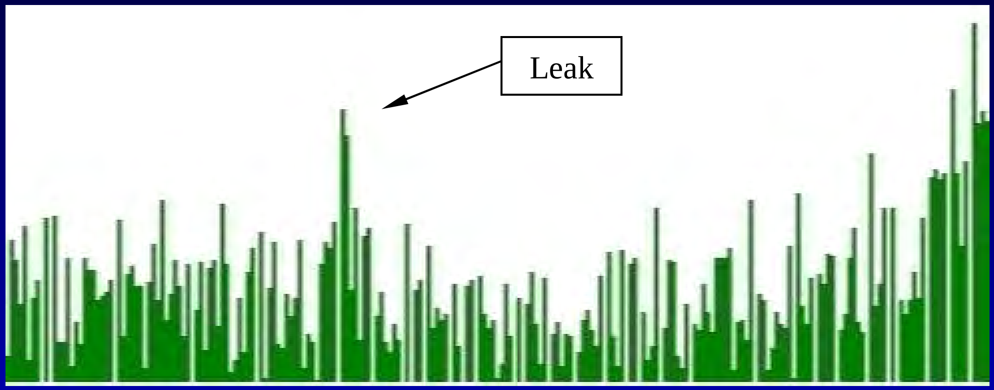
Engineer Research and Development Center

Dual Temperature System



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Domestic Potable Water Leak Survey

US Army Corps
of Engineers

Engineer Research and Development Center

Acoustic Listening Instrument

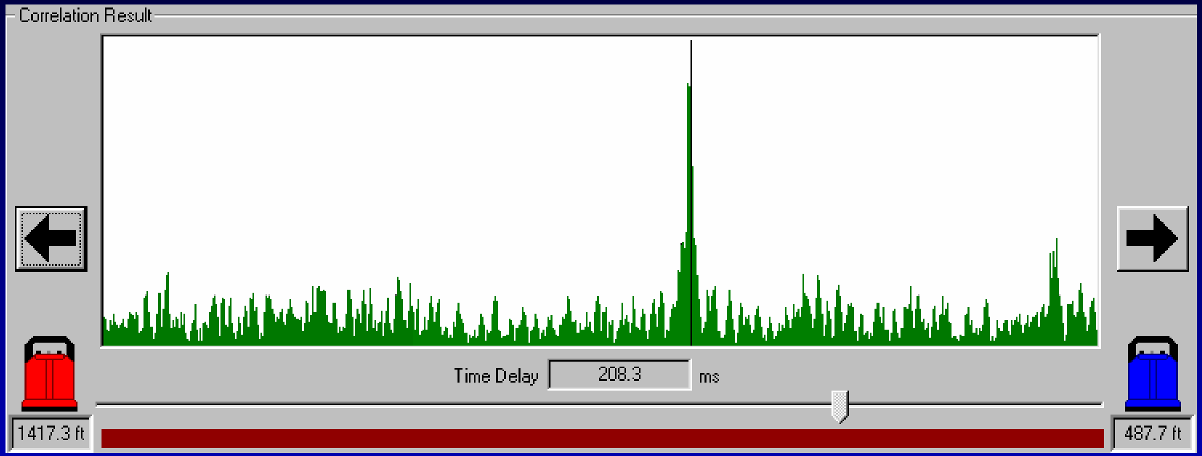
Texas Sized Fire Hydrant

US Army Corps of Engineers

Summary of Leaks Found

- Number of Acoustic Measurements Made – 2344
  (for 328 miles, this is an average spacing of 738 feet)
- Main Line Leaks Found
  – With water showing – 4
  – Without water showing – 2
- Leaks Found At Fire Hydrants
  – With water showing – 10
  – Without water showing – 57
- Leaks Found Inside Buildings
  – With water showing – 4
  – Without water showing – 33

Supply Leak



Leak 1

Leak 2

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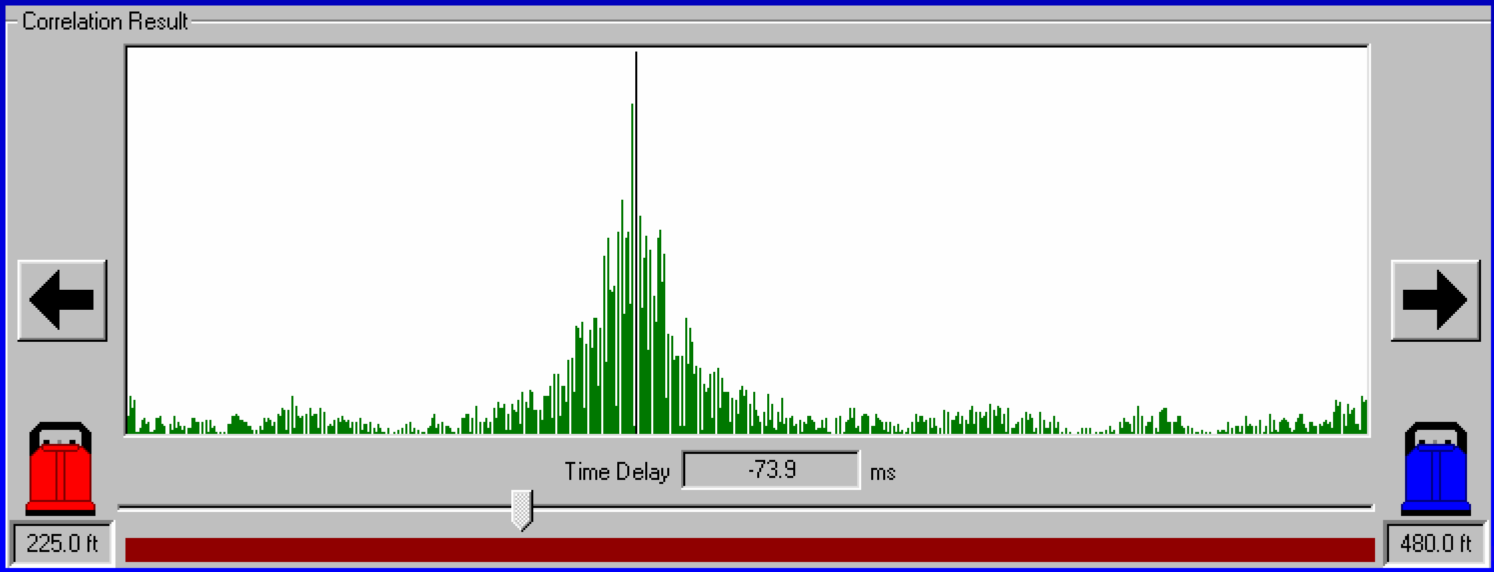
Engineer Research and Development Center

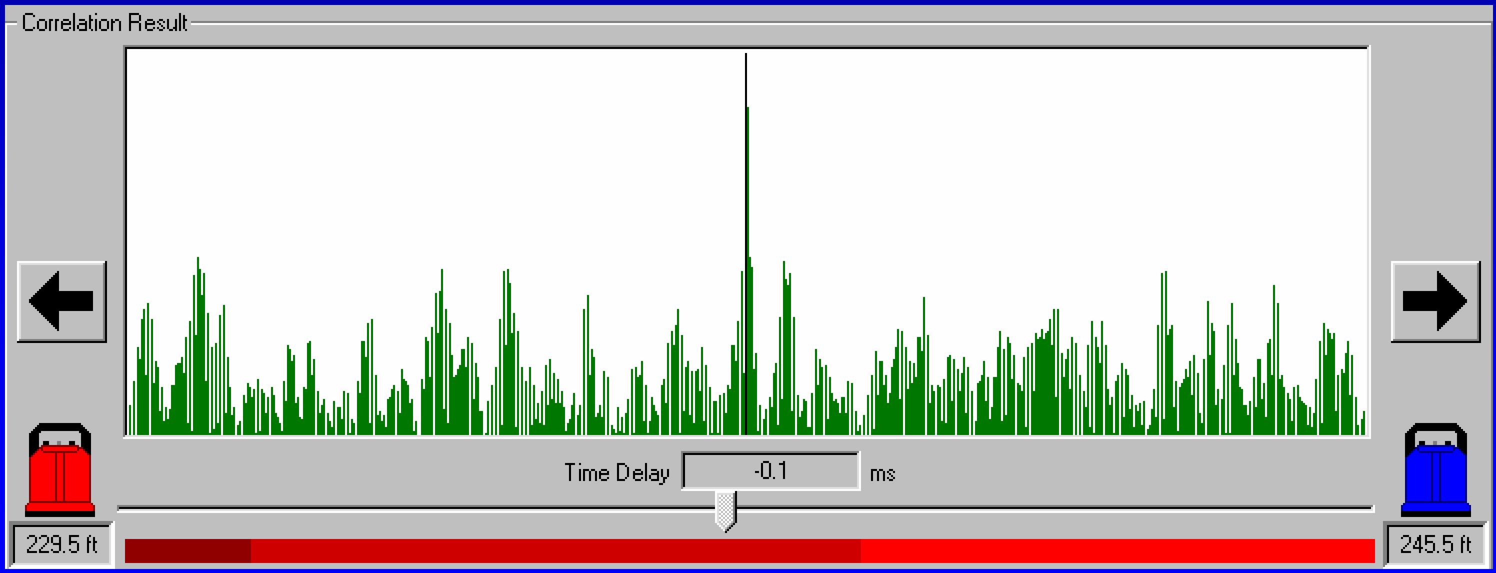
Building 1 Leak

- Although there was no visible surface water at this location, we obtained a strong correlation location. We also heard sounds of flowing water using a ground microphone.
- It is possible this is inside the house.



Building 2

- Although there was no water showing at this location, we obtained a strong correlation location. We also heard sounds of flowing water using a ground microphone.
- There is no alternate explanation for this result.



Conclusions

- **Conclusions**
  - **Acoustic listening equipment is effective at rapidly finding leaks with a sensor placement spacing of up to 1000 feet**
  - **Acoustic listening instruments can listen to flow noise through sensors coupled to a pipe magnetically, mechanically, or through the soil using a ground microphone**
  - **Acoustic Correlation leak detection is highly effective at locating leaks as small as 0.1 gal/hr**
  - **Both instruments are effective on a wide range of pipe materials such as metallic and PVC, and less sensitive on Transite**

Backup Slides

Permalog Sensors

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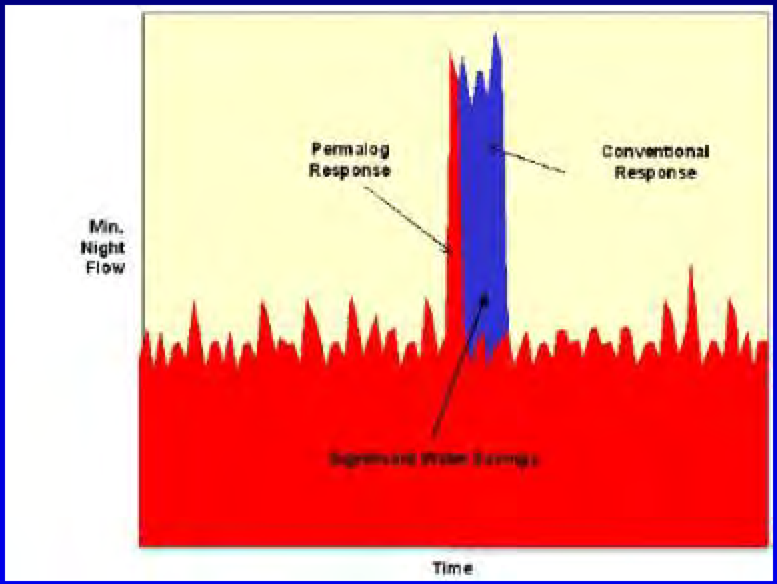
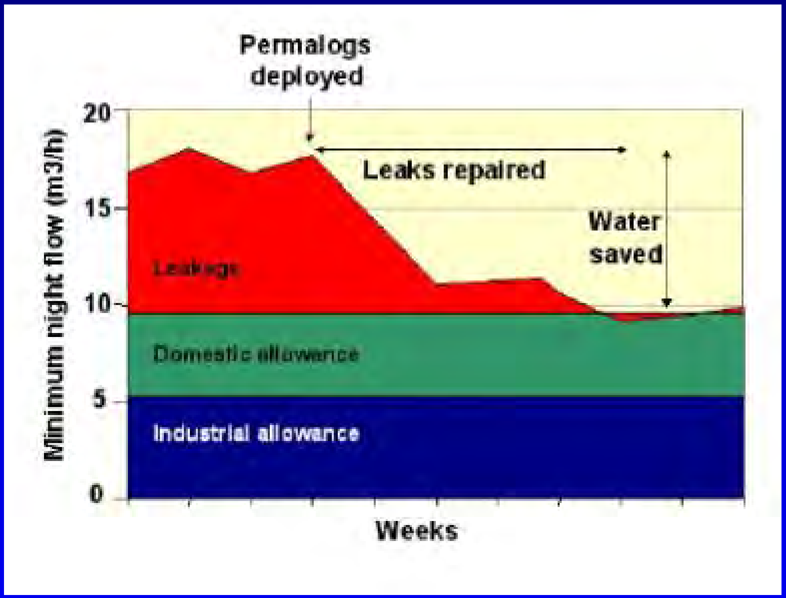
Permanently Installed Sensors





Presentation
for the

2005 Tri-service infrastructure systems conference

Remote Operation System, Kaskaskia Dam Design, Certification, & Accreditation

by

Shane M. Nieukirk, P.E.

Electrical Engineer, St. Louis District

August , 2004

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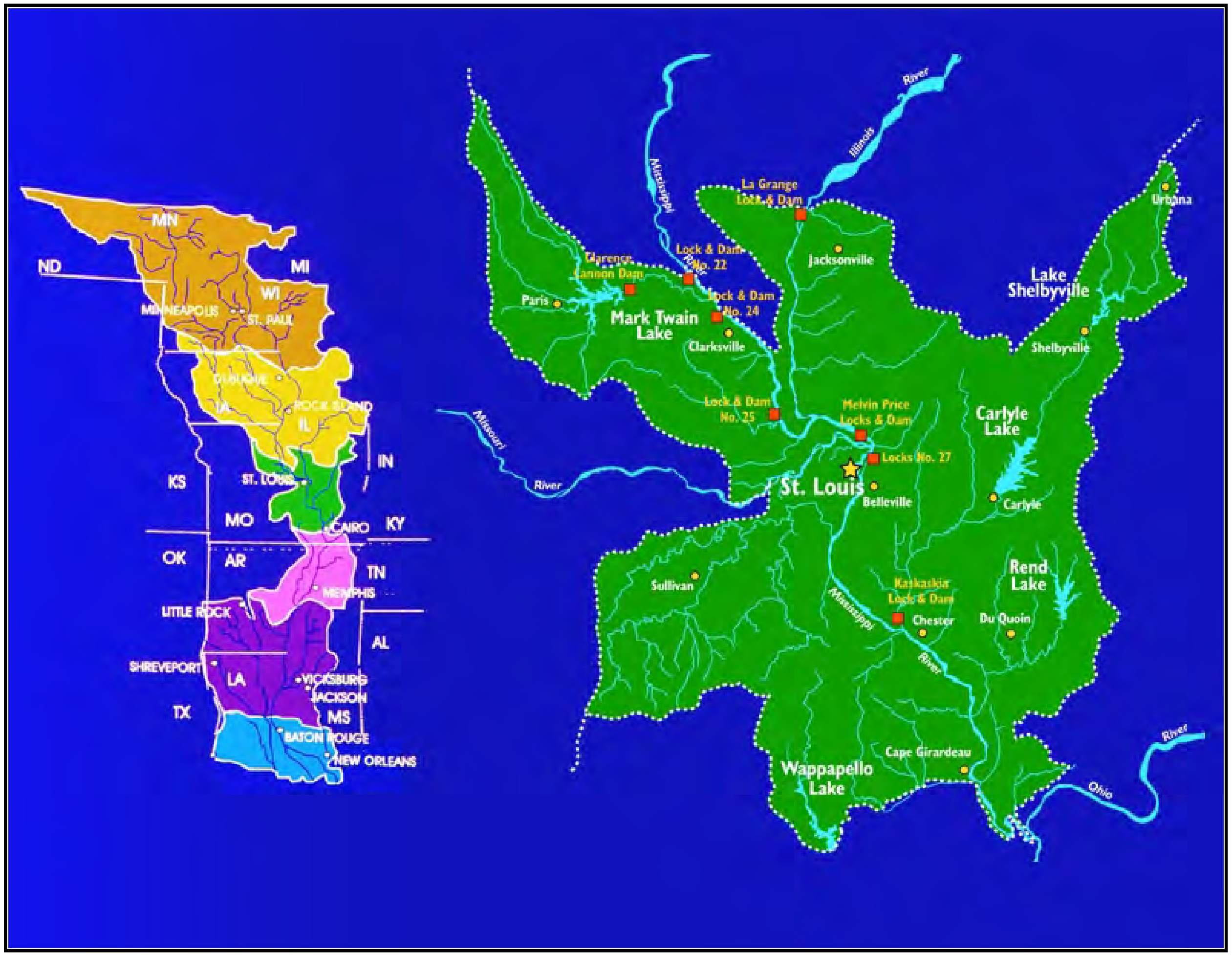
Mississippi Valley Division
Mississippi River Commission

St. Louis District



- 10 rivers
- 5 lock & dam sites
- 5 Corps lakes
- 720 miles of levees
- 92 flood control systems
- 416 miles of navigable channel
- 70 pumping plants
- 162 recreation areas
- 1 hydropower project

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Primary Missions

- Navigation
- Flood Damage Reduction
- Environmental
- Hydropower
- Water Supply
- Readiness
- Recreation
- Regulatory
- FUSRAP
- Interagency/International Support

Agenda

Kaskaskia Lock and Dam

- Overview/Background
- System Design & Architecture
- System Accreditation & Certification

Kaskaskia Navigation Project

- Constructed in 1974
- Located approximately 60 miles south of St. Louis
- Pool provides 36 miles of navigation channel on the Kaskaskia River
- Supports commercial navigation for grain and industry
- Provides water supply to several communities
- Project includes:
  - 600’ x 84’ Lock Chamber
  - Two 60’ Tainter Gates

Remote Operation System

- The FY04 budget for the project was $2.4M. The initial FY05 budget was $392k.
- Operations Division requested the design of a system to control the pool in the event 24/7 operation of the project could not be maintained.
- System was designed by Engineering Division at a cost of $30,000. Startup and EDC totaled another $29,500.
- Electrical enclosures were fabricated locally at a cost of $51,150.
- Installation of enclosures, conduit, cable, & CCTV was under a separate contract at a cost of $123,525.

Kaskaskia Navigation Project

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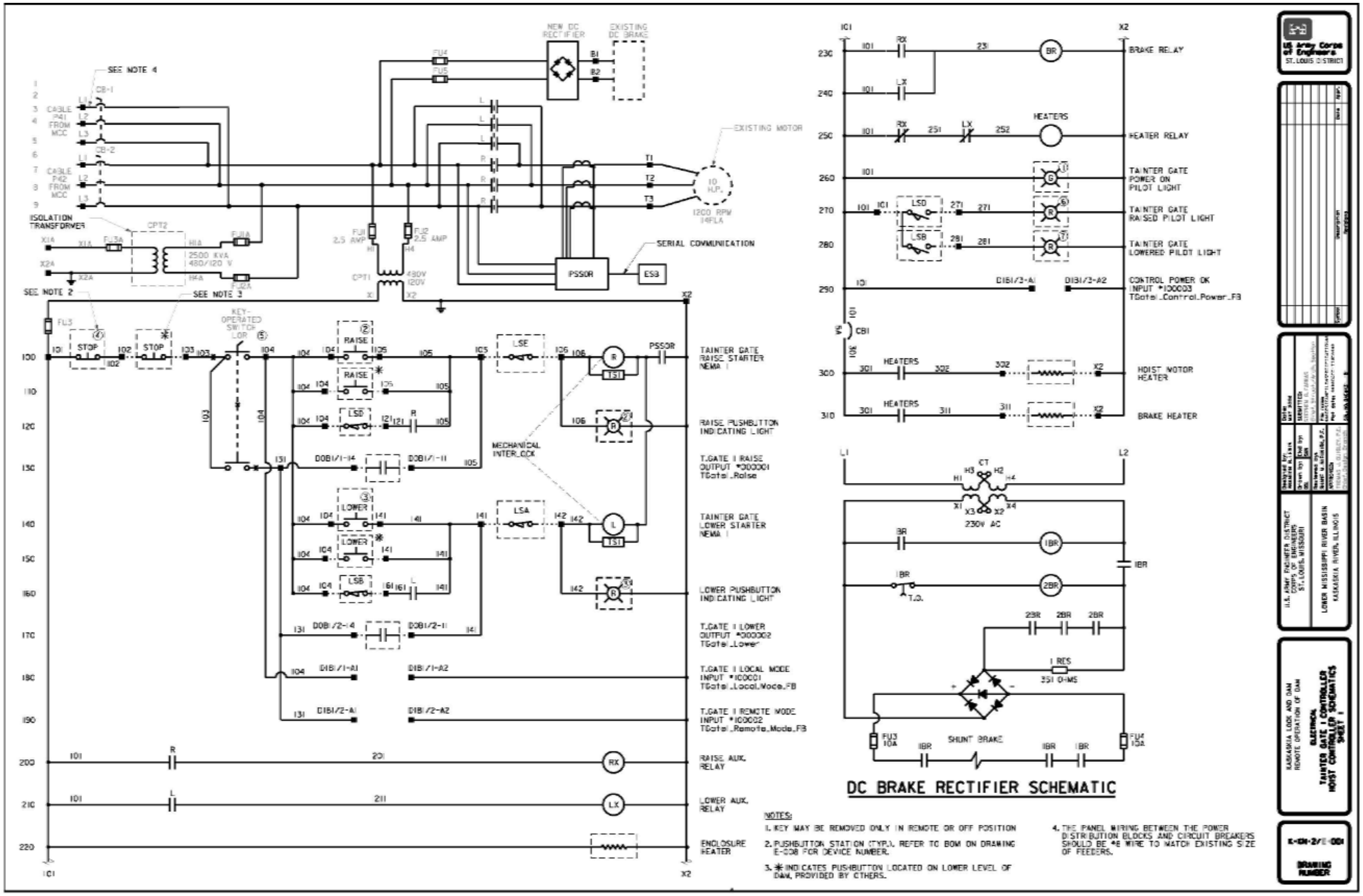
Tainter Gate Hoist Controller



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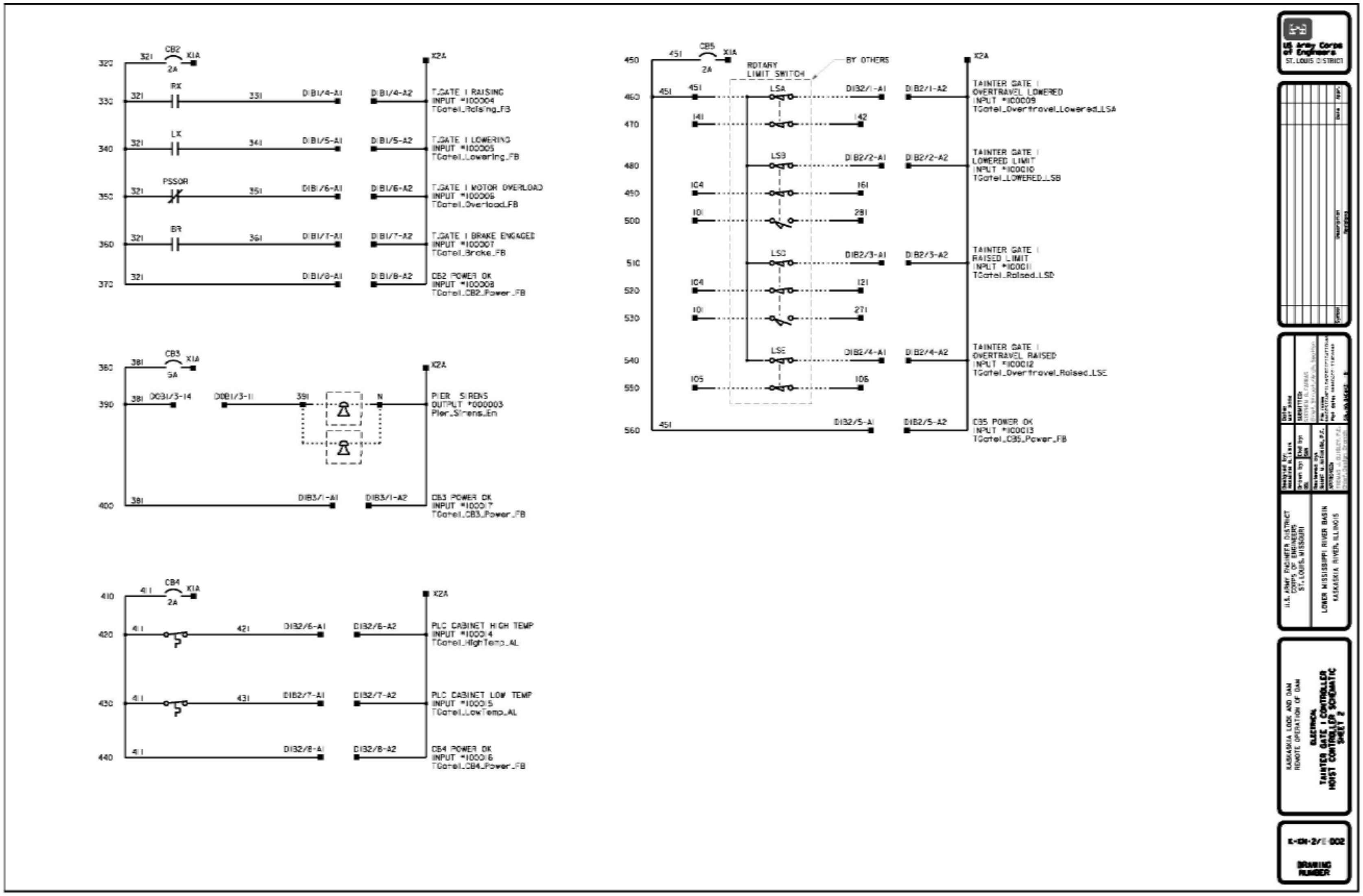
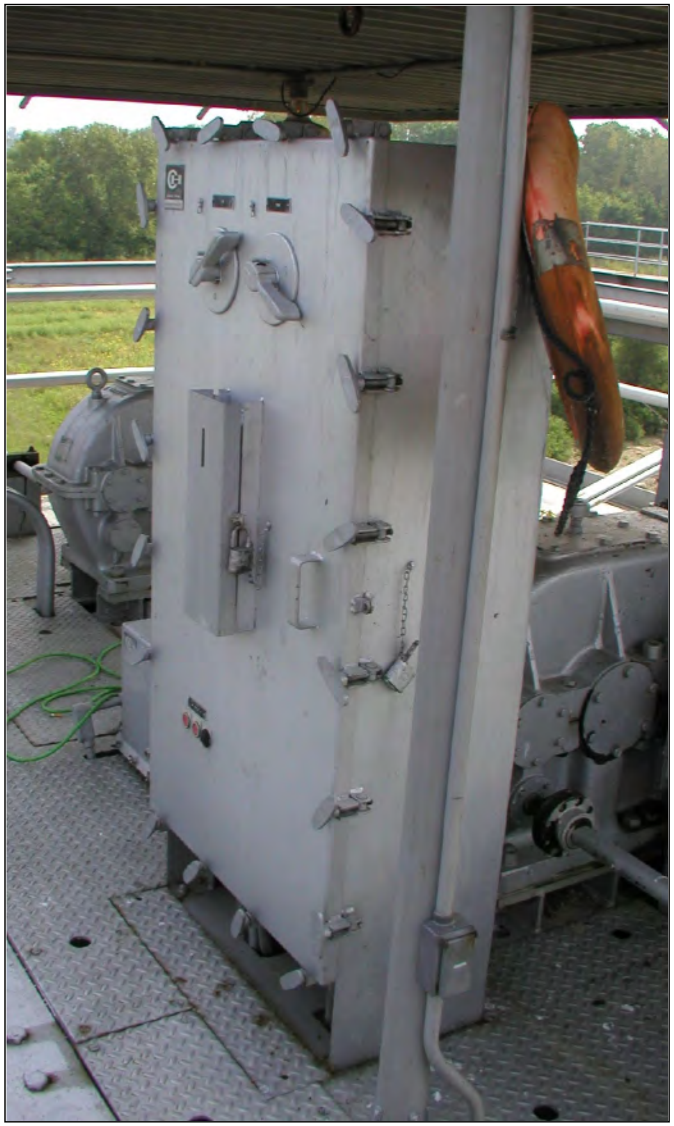
Tainter Gate Hoist Controller

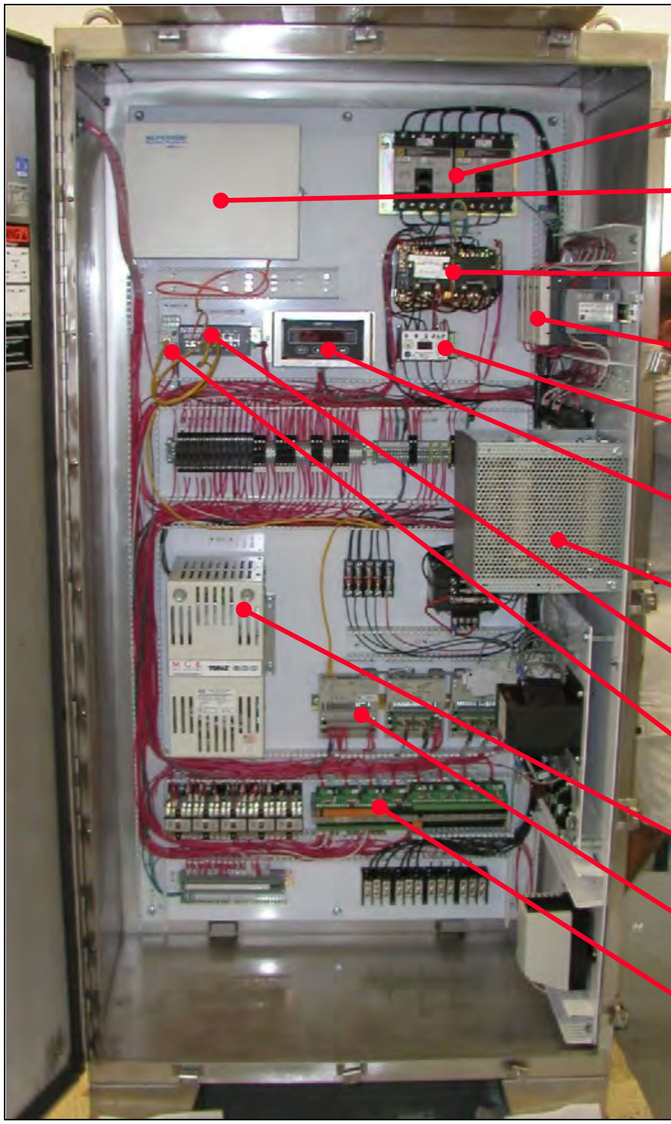


Tainter Gate Hoist Controller



- Two Tainter Gate Hoist Controllers and an Ethernet Switch Enclosure were fabricated in a panel shop
  - Greater control over equipment delivered
  - Greater oversight of fabrication
  - Tested by the Government
- Enclosures were installed under a separate contract

Tainter Gate Hoist Controller

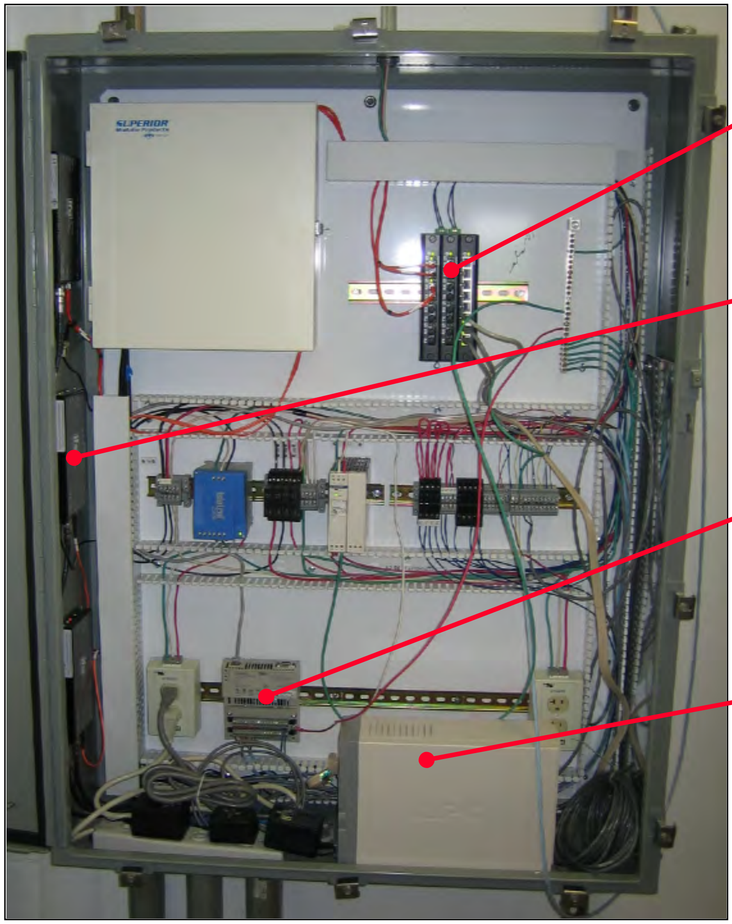


- Mech. Interlock Circuit Breaker
- Fiber Optic Interconnect
- Reversing Starter
- Power Supplies
- Solid-State Motor Overload
- Resolver Interface Module
- DC Brake Rectifier
- Industrial Ethernet Switch
- Ethernet-Serial Bridge
- Isolation Transformer
- Schneider Momentum PLC
- Isolation Relays

Tainter Gate Hoist Controller

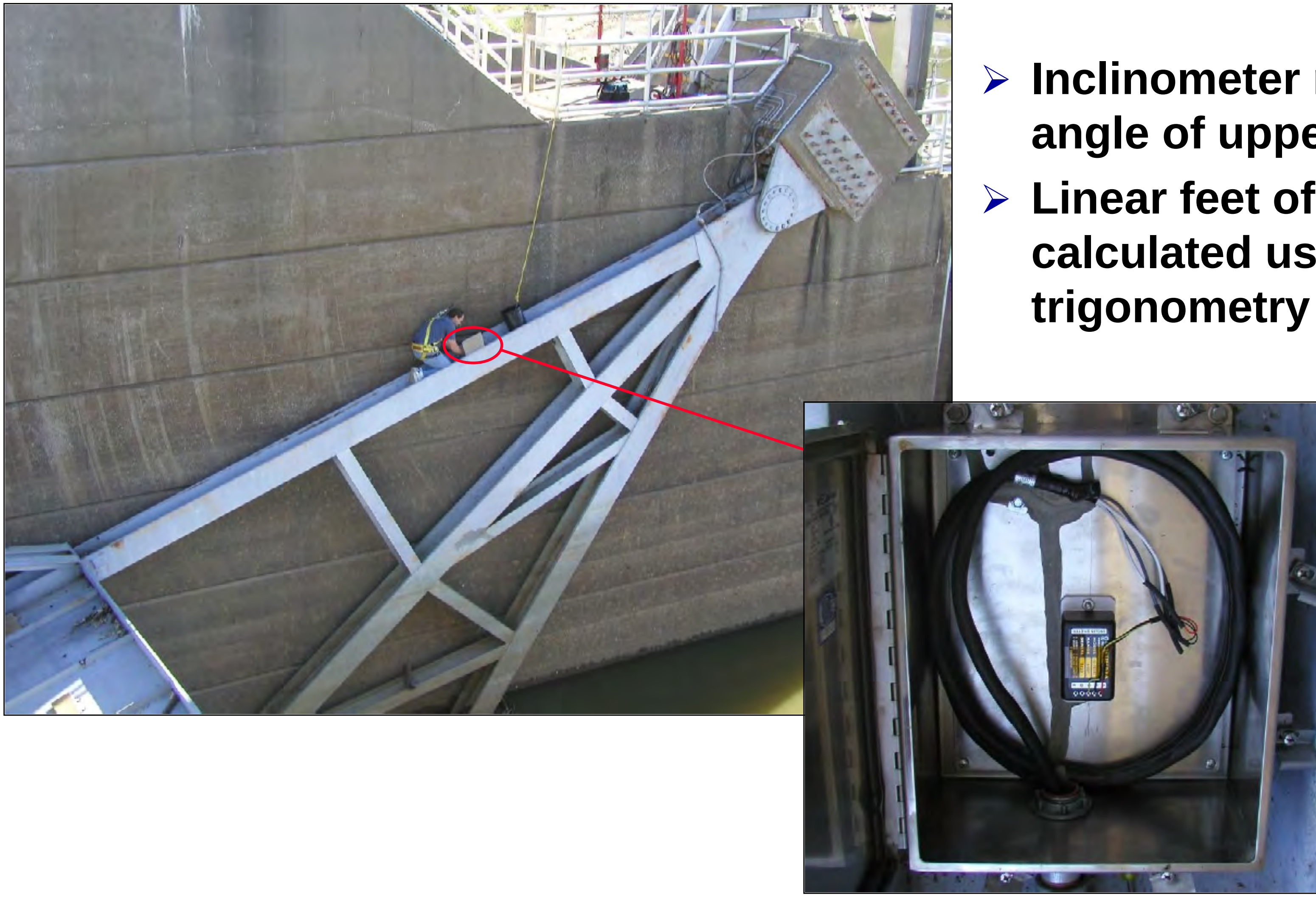
- Local controls provided in a separate enclosure on the side of the controller
- Includes a keyed Local-Off-Remote selector switch
- Key cannot be removed while in Local mode (also cannot close enclosure with key in place)S

Ethernet Switch Enclosure



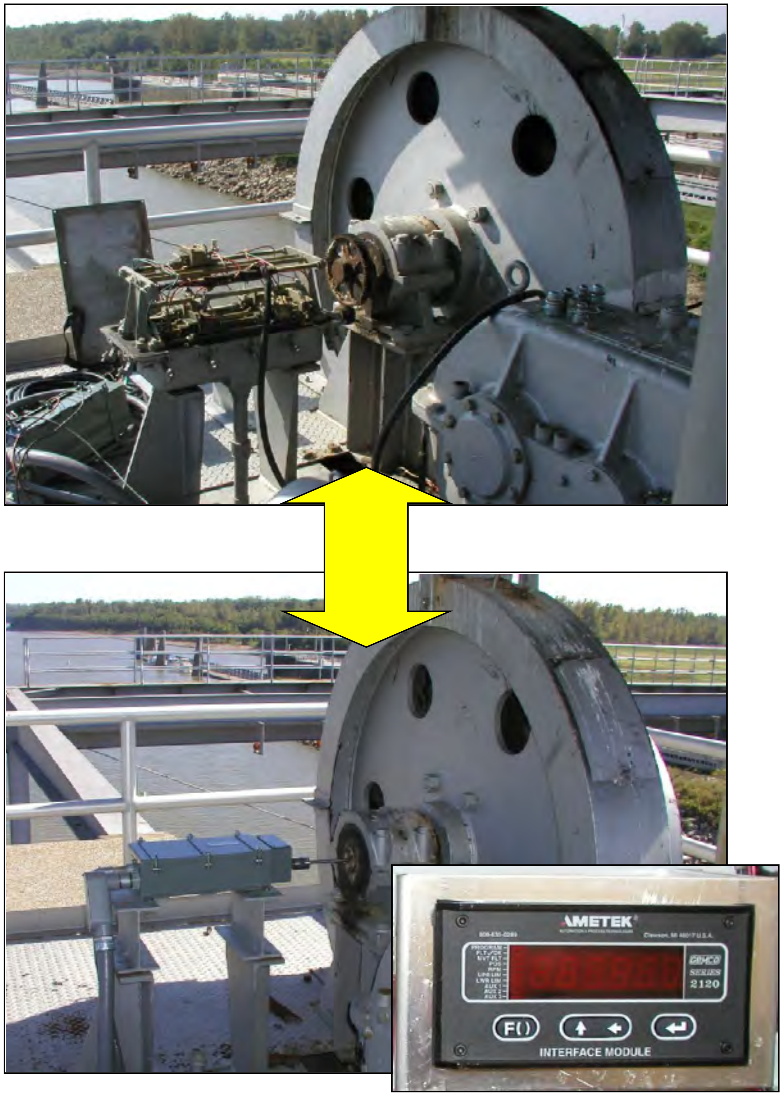
- Provides Ethernet connectivity to the PLCs on the dam
- Enclosure houses the F/O transceivers for the CCTV cameras
- A Momentum PLC processor was added for water levels
- Uninterruptible power supply

Tainter Gate Position



- Inclinometer measures angle of upper strut
- Linear feet of opening is calculated using trigonometry

Tainter Gate Limit Switch



- Original traveling nut limit switch was replaced by a rotary cam limit switch (Gemco 1980R)
- Includes integral gear reduction and resolver for hoist position. Requires interface module for a 4-20mA input to PLC
- The 1980 was used in lieu of the 1997 to avoid the cost of the incremental control. This feature was implemented in the PLC

Water Level Sensing

- In a effort to save money dedicated sensors were not installed
- Original approach was to access all levels across the network
- Because the network data was received by satellite and was not real-time, a PLC was added to interface with Water Control's float gages
- Pool and tailwater levels are analog inputs from shaft encoder
- Other river stage data is accessed from a database across the network

Closed Circuit Television

- **Two cameras provide coverage of the pool, gate, and staff gage**
- **One downstream camera provides coverage behind the tainter gates and downstream of the dam**
- **Cameras are accessible across the network via a digital video recorder**
- **DVR is accessed using Internet Explorer or client software**

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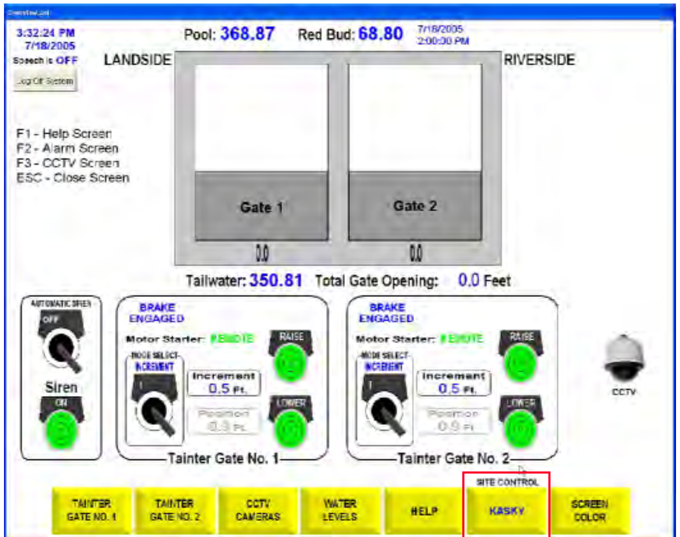
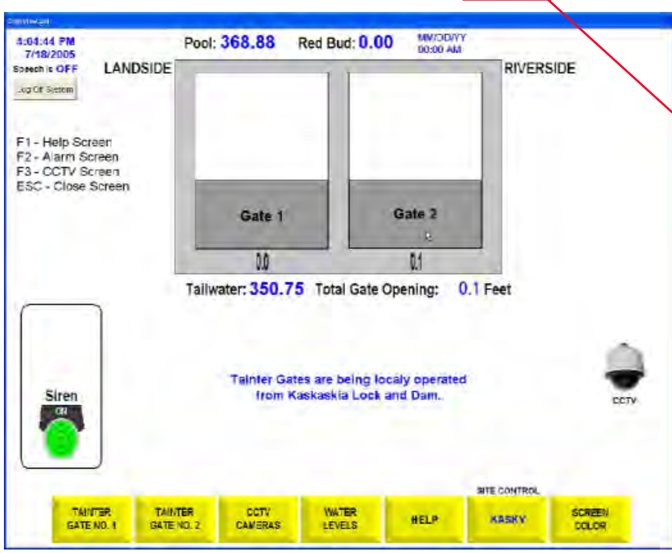
Human Machine Interface

Local

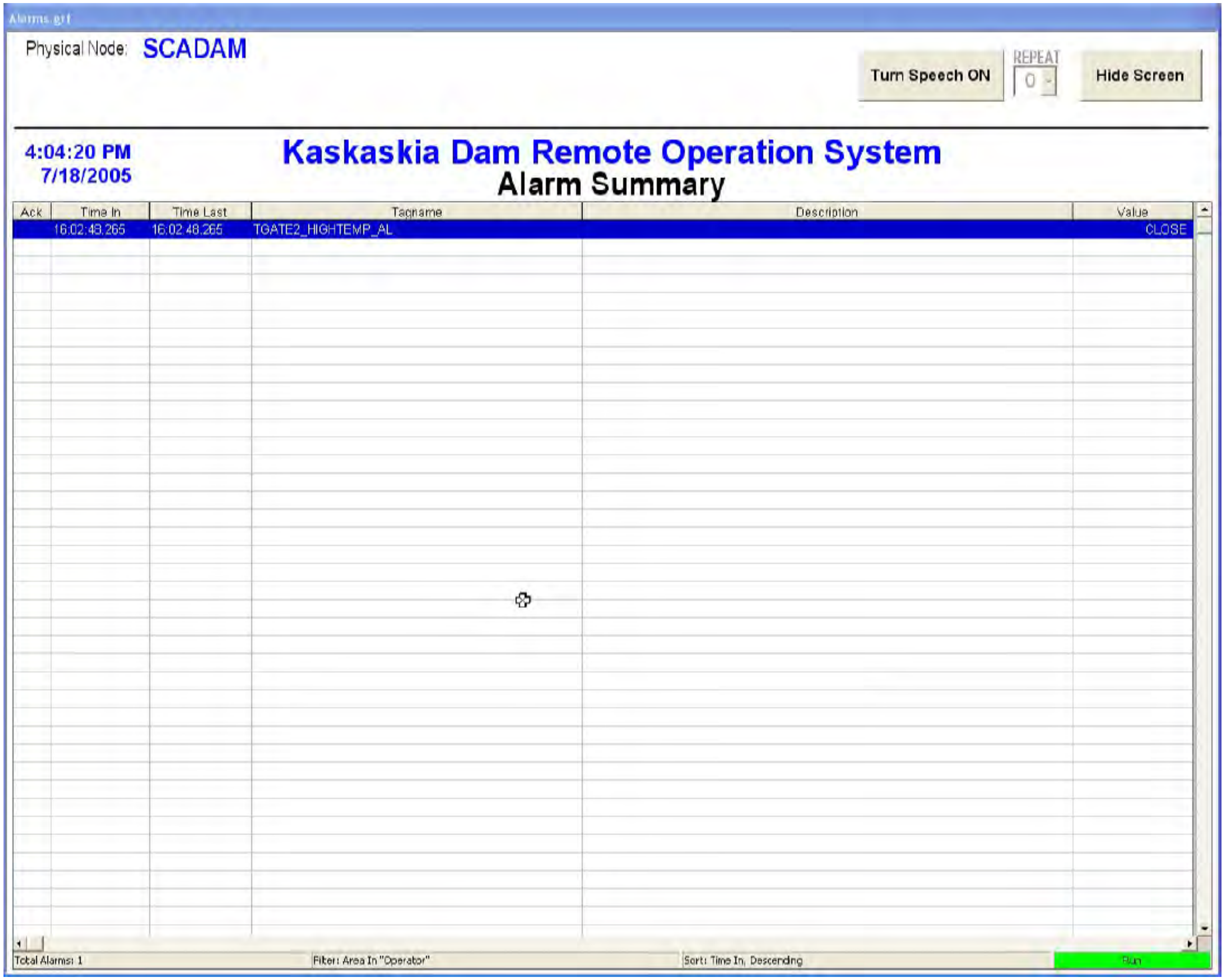


Remote

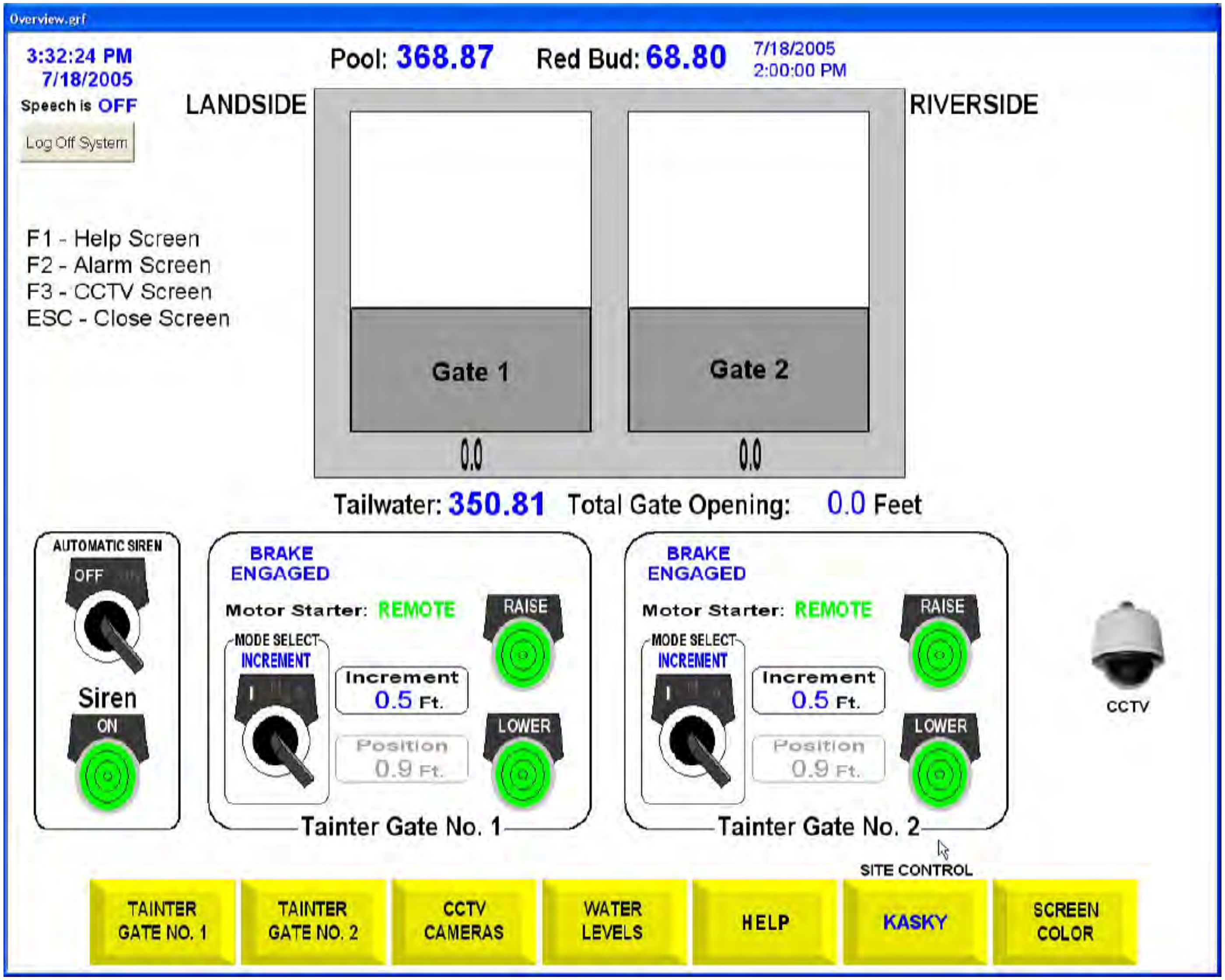


- **iFIX by GE Fanuc**
- **A single application is used between both the local and remote locations**
- **Each location is stand alone (SCADA node) communicating to each PLC**
- **Both locations cannot control the dam at the same time. This is controlled by the local site**

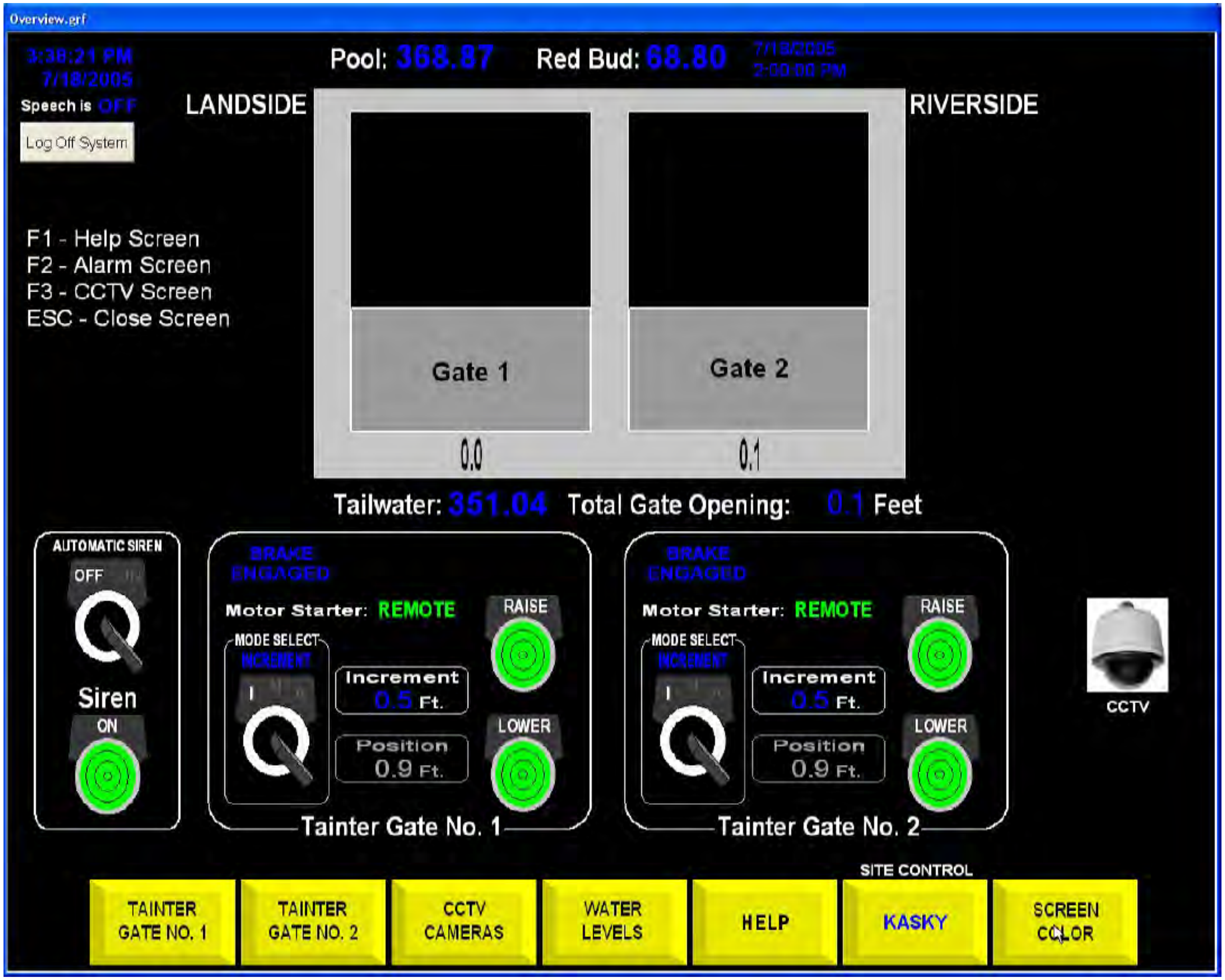
Human Machine Interface



Human Machine Interface



Human Machine Interface



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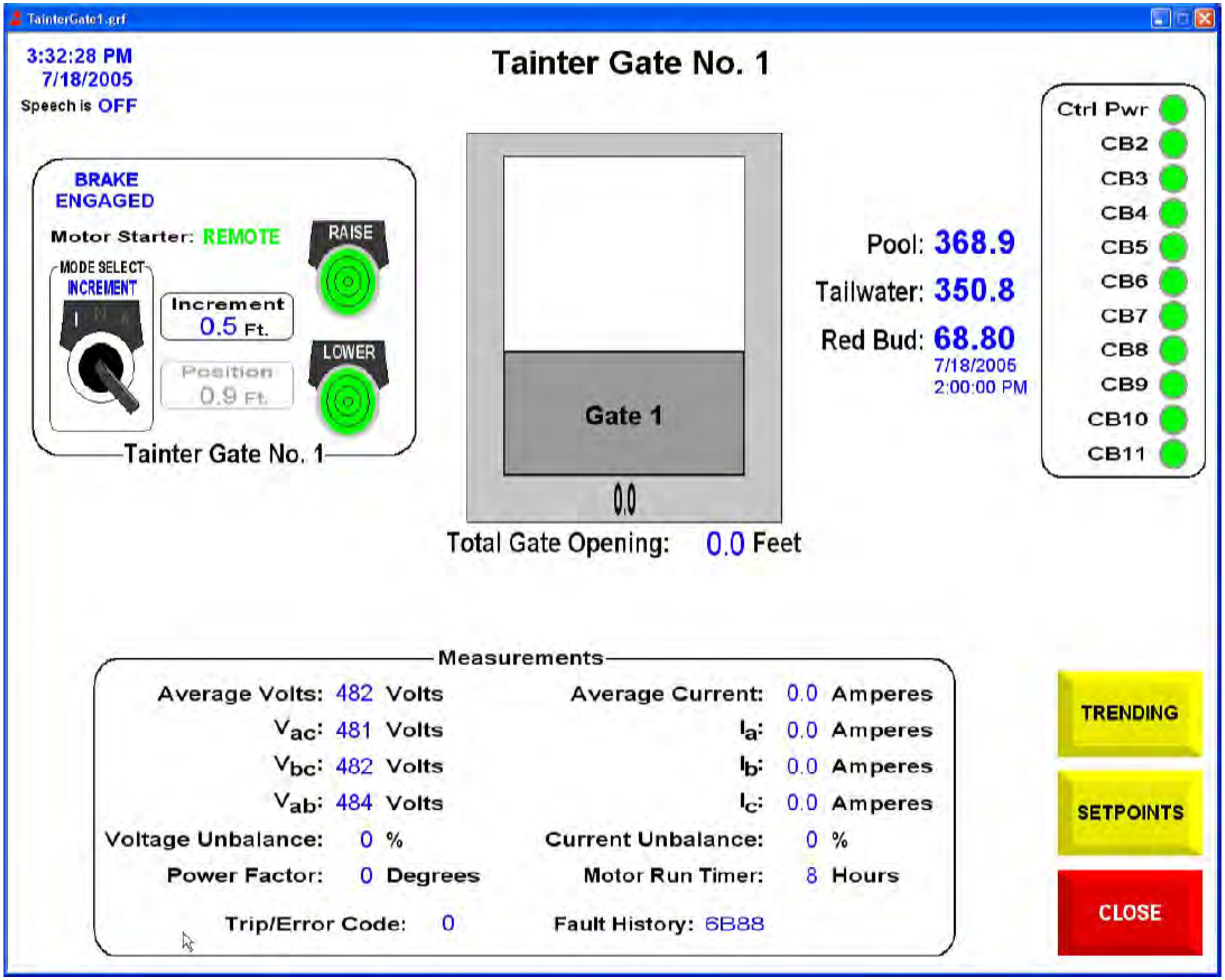
Human Machine Interface



One Corps Serving the Armed Forces and the Nation

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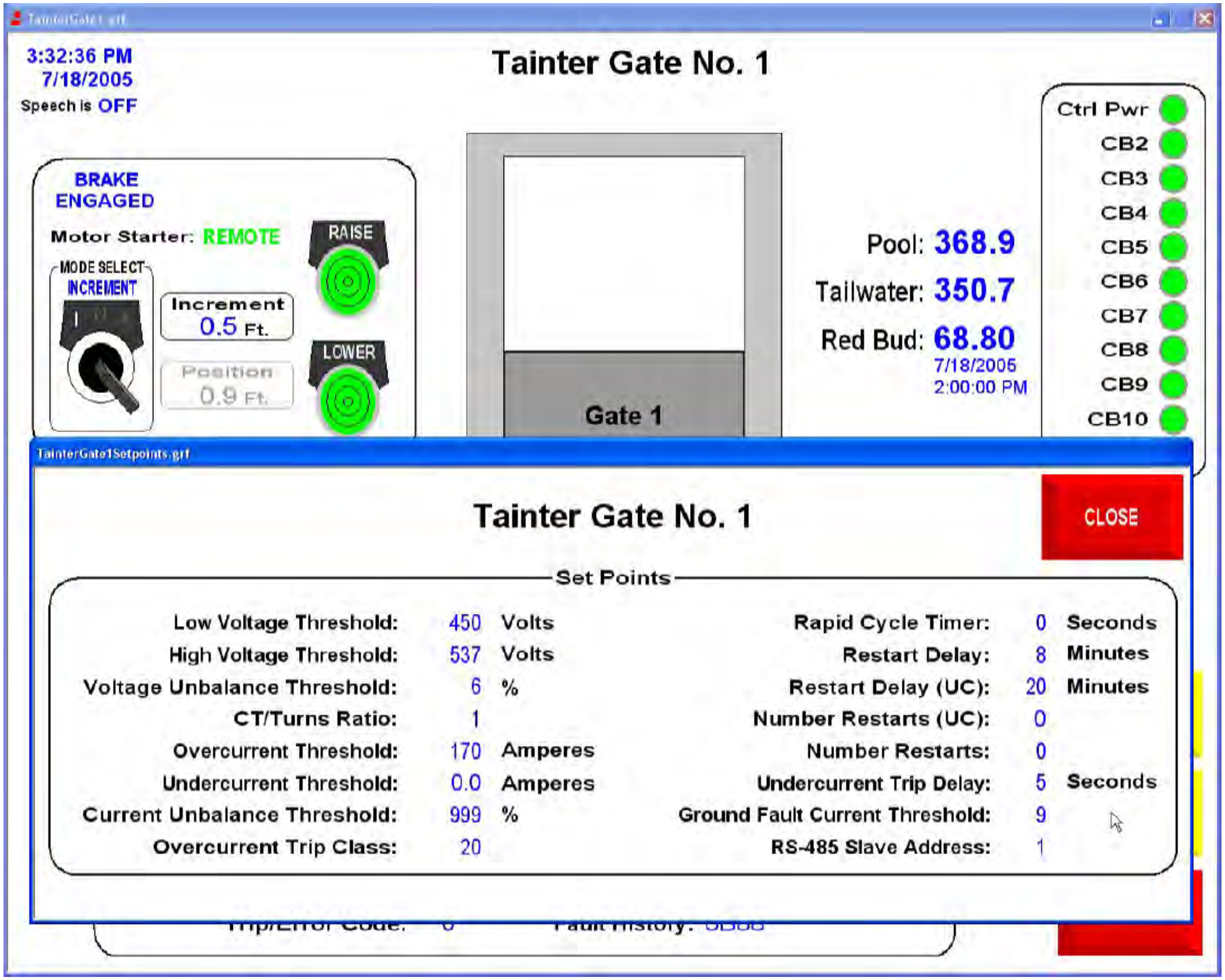
Human Machine Interface



One Corps Serving the Armed Forces and the Nation

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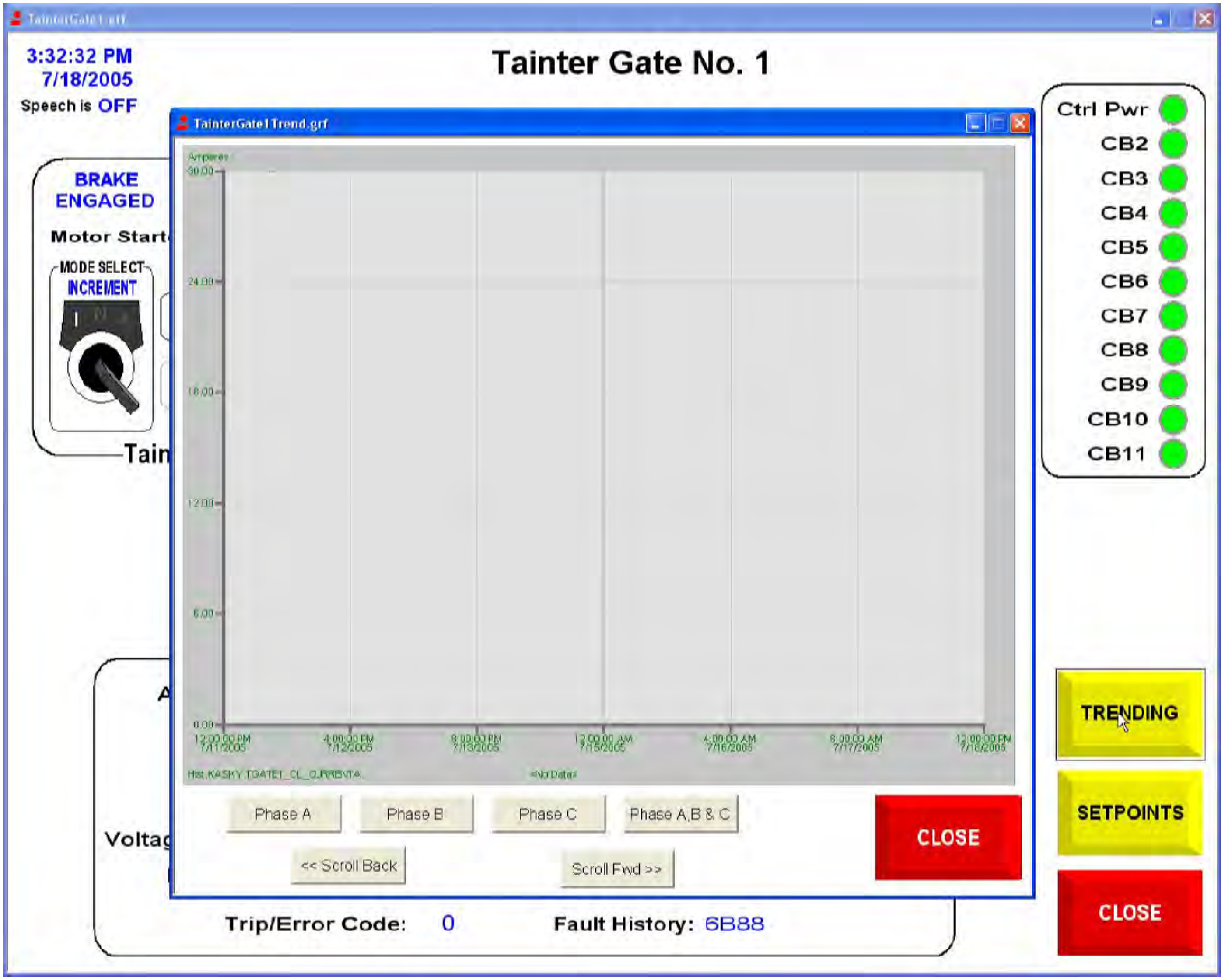
Human Machine Interface



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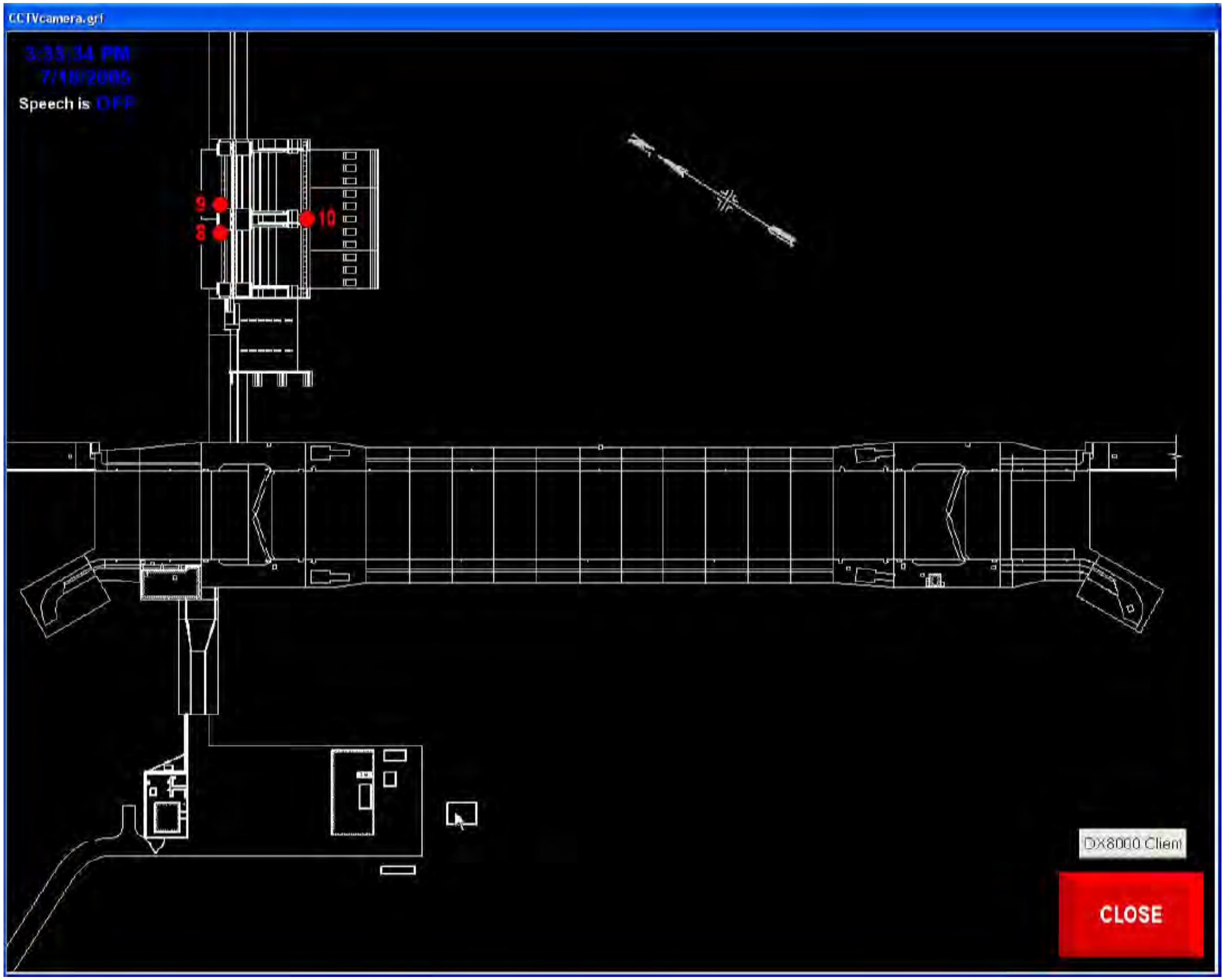
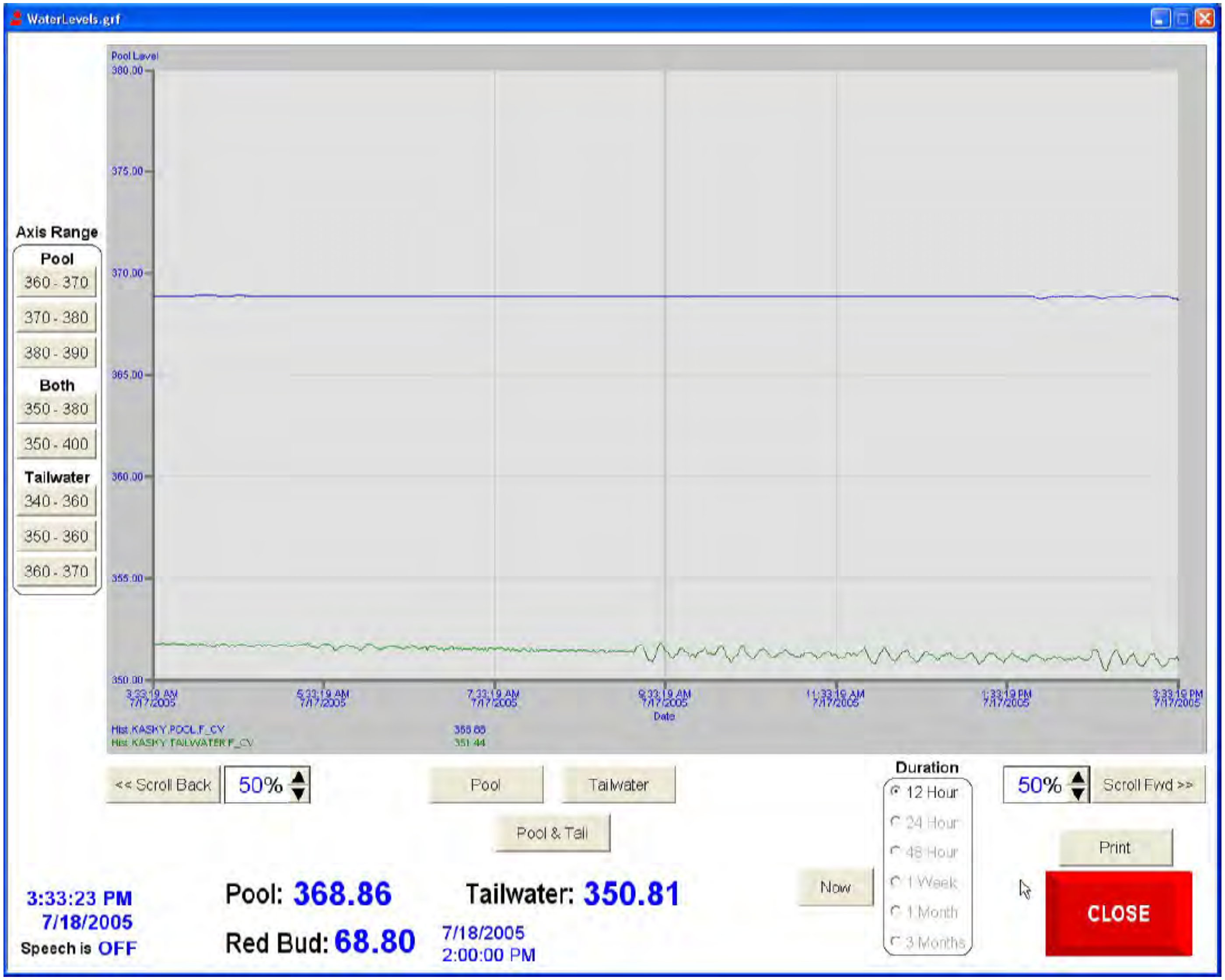
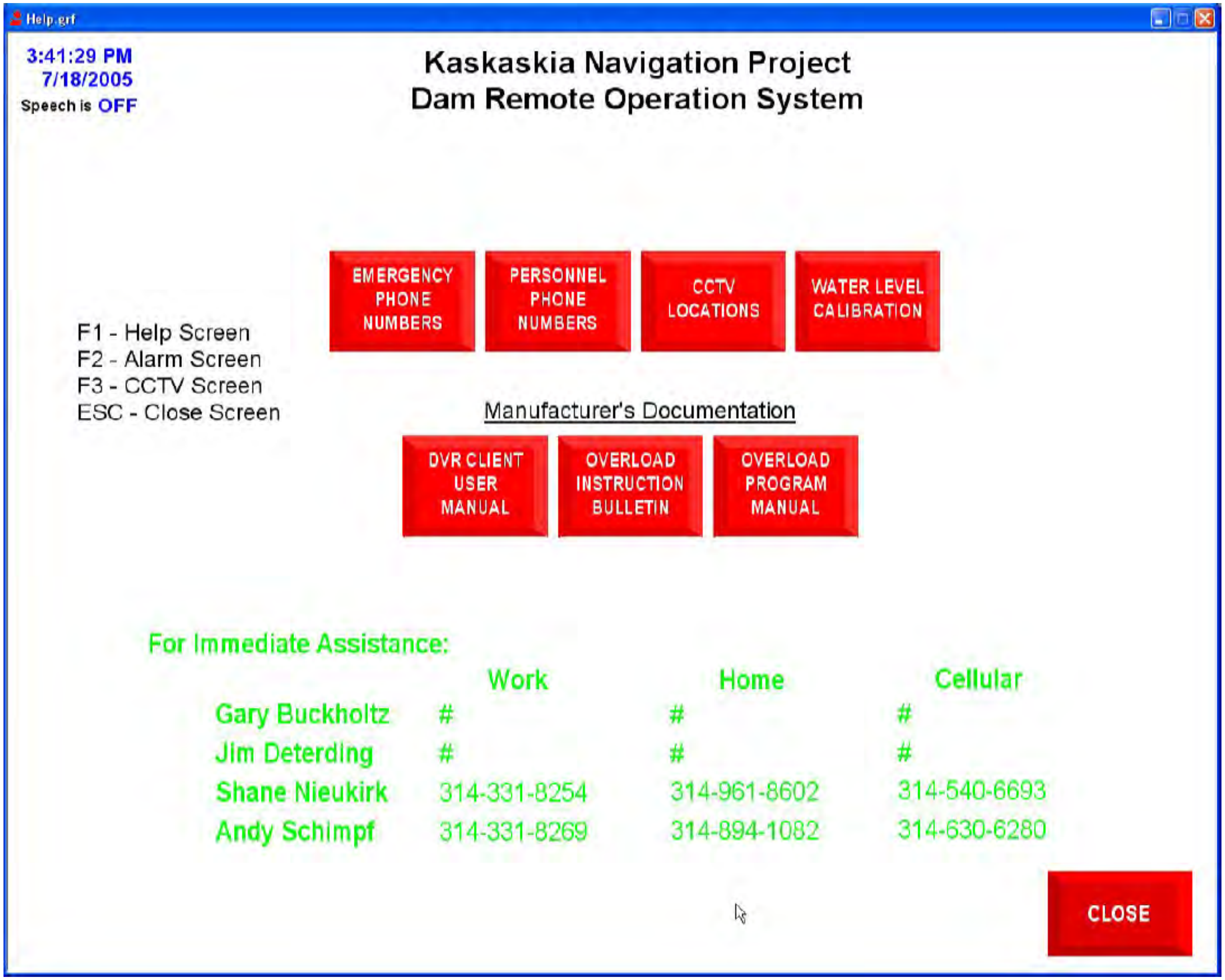


Human Machine Interface

Human Machine Interface



Human Machine Interface



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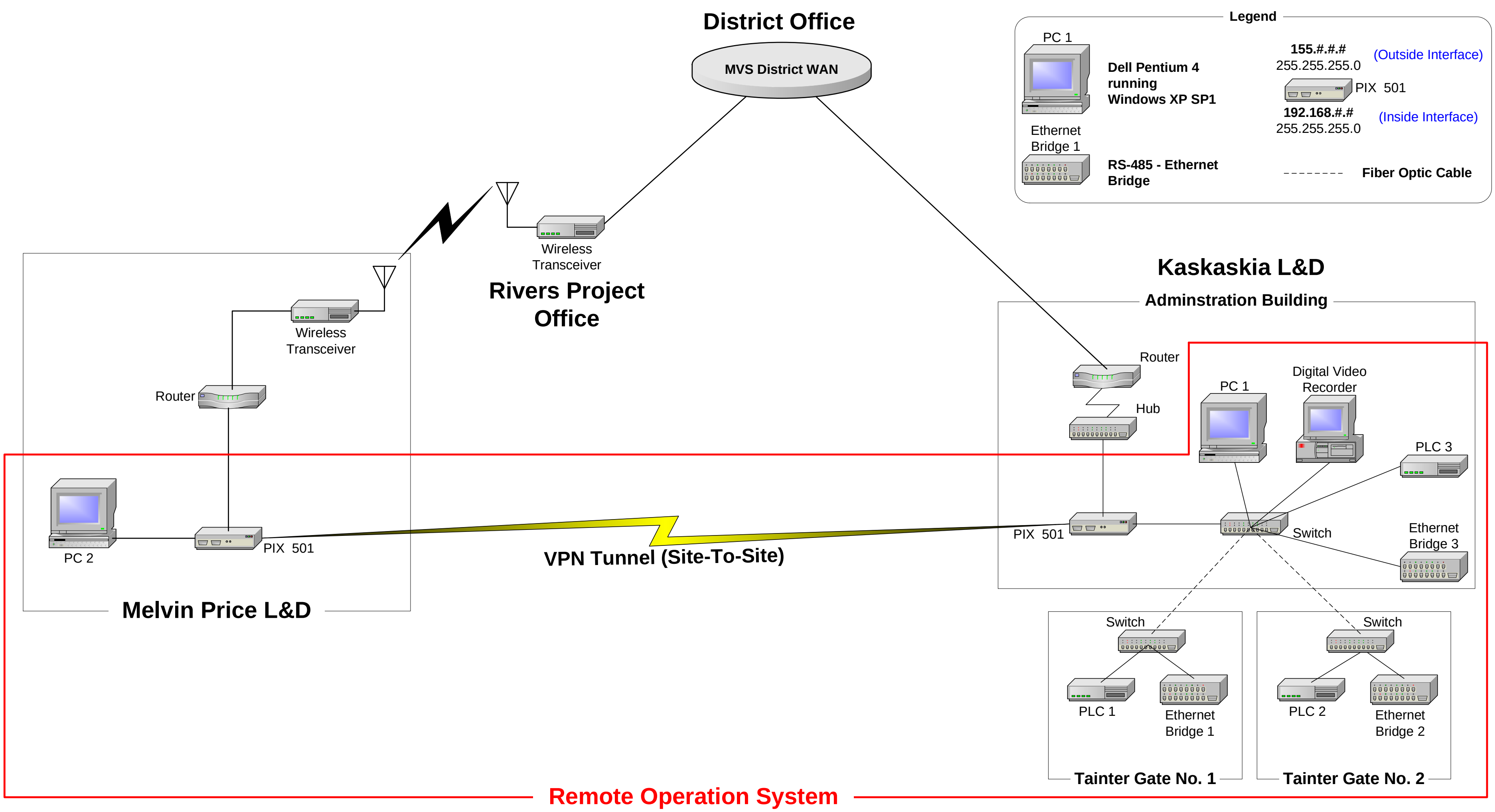
Network Diagram



One Corps Serving the Armed Forces and the Nation

System Description & Functionality

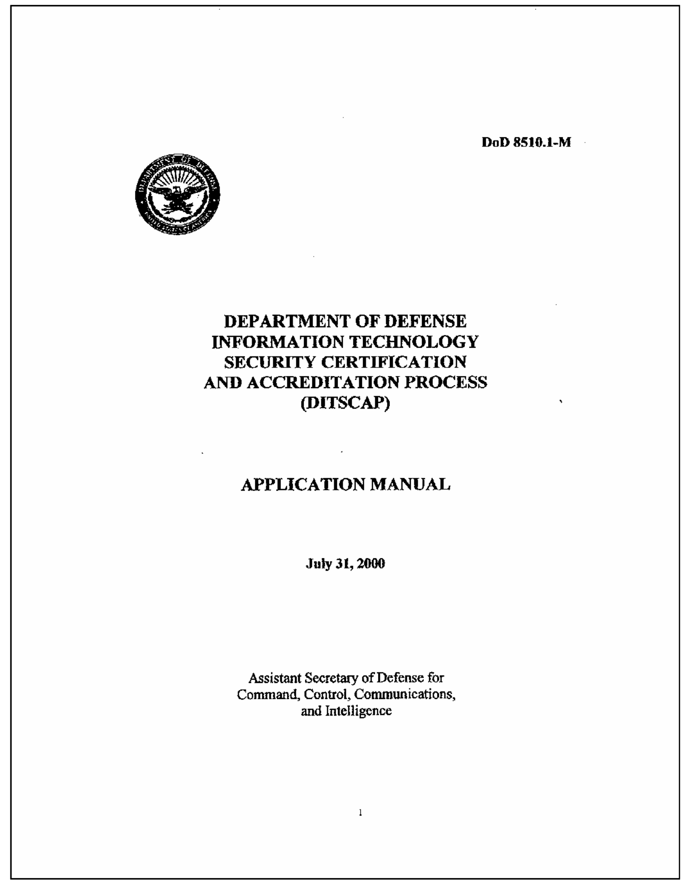
- Operators login using local user accounts
- Passwords are updated manually. Distributed using encrypted email with CAC
- Patches and updates to be installed manually using PCAnywhere
- Access to VPN firewall using local user accounts (including extended authentication)

HQ Guidance for SCADA Systems

- No formal guidance concerning the connection of SCADA systems to the network exists
- As a result of a briefing given to HQ's Information Assurance Section, informal guidelines were developed
- Questions concerning the guidelines resulted in a "cease and desist" order for the Information Assurance Program Manager
- HQ directed the St. Louis District to certify and accreditate the Remote Operation System using DITSCAP prior to placing it online

DoD Information Technology Certification and Accreditation Process (DITSCAP)

- **DITSCAP is defined by DoD Instruction 5200.40**
- **Developed to meet the requirements of DoD Directive 5200.28. This includes:**
  - **Stand-alone PCs**
  - **Connected Systems**
  - **Networks**
- **Instructions for the process are provided in DoD Manual 8510.1-M**



DoD 8510.1-M

DEPARTMENT OF DEFENSE
INFORMATION TECHNOLOGY
SECURITY CERTIFICATION
AND ACCREDITATION PROCESS
(DITSCAP)

APPLICATION MANUAL

July 31, 2000

Assistant Secretary of Defense for
Command, Control, Communications,
and Intelligence

1

DoD Information Technology Certification and Accreditation Process (DITSCAP)

- **DITSCAP uses a single document approach collecting all of the information into the Systems Security Authorization Agreement (SSAA).**
- **The SSAA is a formal agreement among the Designated Approval Authority (DAA), Certifying Authority (CA), Program Manager, and User Representatives.**
- **To aid in the development of the SSAA, HQ has directed that all new DITSCAPs use the Xacta tool.**
- **Xacta is a web-based application that assures SSAA consistency across USACE.**

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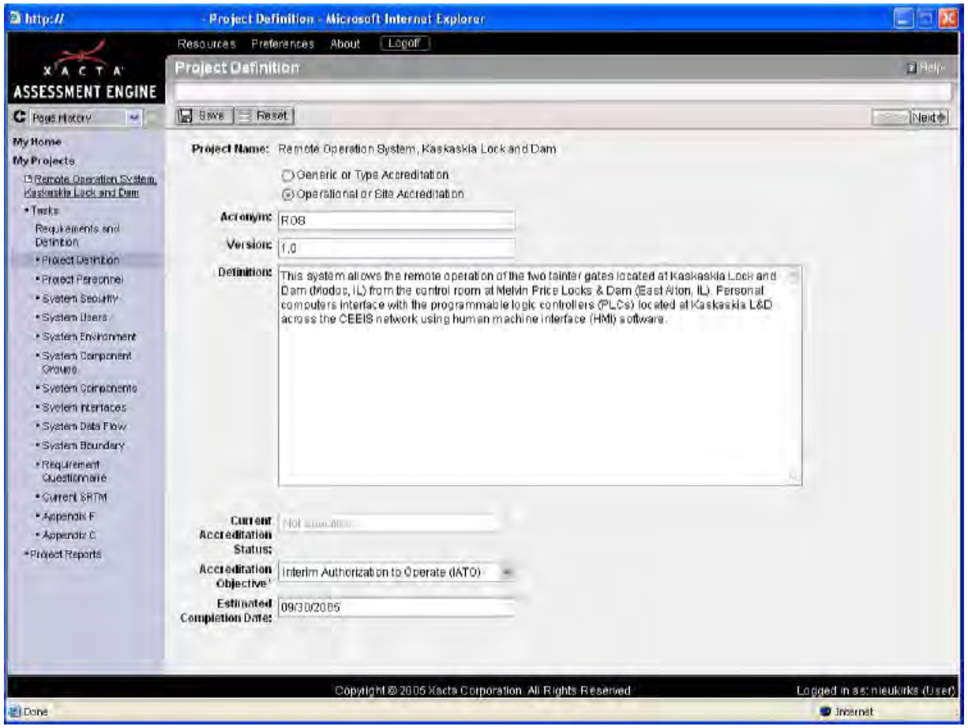
Xacta Information Assurance Manager

- Accessed using Internet Explorer
- The tool is administrated by Mr. William Barnett of HQ (contractor)
- Access is granted after completing a user request form
- To access the tool, all pop-up blockers and outside toolbars (Google) must be turned off



Systems Security Authorization Agreement

- Characteristics of the SSAA:
  - Describes operating environments and threats
  - Describes the system security architecture
  - Identifies required hardware, firmware, software, etc.
  - Establishes the C&A boundary
  - Documents all requirements necessary for accreditation
  - Documents the DITSCAP plan including test plans and procedures, certification results, and residual risk
  - Forms the baseline security configuration document
- DITSCAP includes four phases
- Each phase is comprised of "activities" which are broken down further into "tasks"

DoD Information Technology Certification and Accreditation Process (DITSCAP)

- **DITSCAP Phases:**
  - **Phase 1, Definition**
    - **Verify system mission, environment, and architecture. Identify threats. Define level of effort and team members.**
  - **Phase 2, Verification**
    - **Document compliance of system with security requirements.**
  - **Phase 3, Validation**
    - **Assure system environment and configuration provides acceptable level of risk.**
  - **Phase 4, Post Accreditation**
    - **Monitor systems management, configuration, and changes to the operational and threat environment to assure acceptable level of risk is preserved.**

DITSCAP – Phase 1, Definition

- **Activities**
  - **Preparation, Registration, and Negotiation**
- **Tasks (12)**
  1. **Review Documentation**
  2. **Prepare the System and Functional Description, System Identification**
  3. **Register the System (Define the C&A Team)**
     - **<u>Designated Approval Authority (DAA)</u> has final approval of the SSAA. The DAA is often the District Engineer**
     - **<u>Certifying Authority (CA)</u> identifies security requirements**
     - **<u>Information Security Systems Officer</u> (ISSO) insures system is accurately documented**
     - **<u>Program Manager</u> defines the system and security architecture and supports DITSCAP tailoring**

DITSCAP – Phase 1, Definition

- **Tasks (12)**
  4. **Prepare Environment and Threat Description**
  5. **Determine System Security Requirements**
  6. **Prepare System Architecture Description (hardware, software…)**
  7. **Identify the C&A Organizations and Resources Req'd**
  8. **Tailor DITSCAP and Prepare Plan (Certification Level)**
  9. **Draft the SSAA**
  10. **Conduct Certification Requirements Review**
  11. **Establish Agreement on Level of Effort and Schedule**
  12. **Approve Phase 1 SSAA**

DITSCAP – Phase 1, Definition

- **Roles**
  - **DAA – Continuously review the system for compliance with the SSAA.**
  - **CA & Certification Team**
    - **Support the DAA**
    - **Review threat description**
    - **Identify security requirements**
  - **PM**
    - **Initiate dialogue with the DAA, Certifier, and User Rep.**
    - **Define system schedule & budget**
    - **Define system & security architecture**
  - **User Representative – defines requirements of the system and end users**
  - **All support DITSCAP tailoring and Certification Level**

DITSCAP – Phase 2, Verification

- **Activities**
  - **SSAA Refinement, System Development and Integration, Initial Certification Analysis, Assess Analysis Results**
- **Tasks (7)**
  1. **System Architecture Analysis**
  2. **Software, Hardware, and Firmware Analysis**
  3. **Network Connection Rule Compliance Analysis**
  4. **Integrity Analysis of Integrated Products**
  5. **Life-Cycle Management Analysis**
  6. **Security Requirements Validation Procedures**
  7. **Vulnerability Assessment**

DITSCAP – Phase 2, Verification

- **Roles**
  - **DAA – Continuously review the system for compliance with the SSAA.**
  - **CA & Certification Team**
    - **Conduct Phase 2 certification analysis tasks**
    - **Identify and assess system vulnerabilities**
    - **Report certification results to the DAA & PM**
    - **Integrate changes into the SSAA**
  - **PM**
    - **Develop system or system modifications**
    - **Support certification efforts**
    - **Modify system to reduce or eliminate vulnerabilities.**

DITSCAP – Phase 3, Validation

- **Activities**
  - **SSAA Refinement, Certification Evaluation of the Integrated System, Recommendation to DAA, DAA Accreditation Decision**
- **Tasks (8)**
  1. **Security Test and Evaluation**
  2. **Penetration Testing**
  3. **TEMPEST and RED-BLACK Evaluation**
  4. **COMSEC Compliance Evaluation**
  5. **System Management Analysis**
  6. **Site Accreditation Survey**
  7. **Contingency Plan Evaluation**
  8. **Risk Management Review**

DITSCAP – Phase 3, Validation

- **Roles**
  - **DAA**
    - **Continuously review the system for compliance with the SSAA**
    - **Determine if security safeguards and residual risks are acceptable**
    - **Sign the accreditation document**
  - **CA & Certification Team**
    - **Complete Phase 3 certification analysis tasks**
    - **Identify and assess system vulnerabilities**
    - **Recommend risk mitigation measures**
    - **Report certification results to the DAA & PM**
    - **Prepare final SSAA & recommendation**

DITSCAP – Phase 4, Post Accreditation

- **Activities**
  - **System and Security Operation, Compliance Validation**
- **Tasks (8)**
  1. **SSAA Maintenance**
  2. **Physical, Personnel, and Management Control Review**
  3. **TEMPEST Evaluation**
  4. **COMSEC Compliance Evaluation**
  5. **Contingency Plan Maintenance**
  6. **Configuration Management**
  7. **Risk Management Review**
  8. **Compliance Validation**

DITSCAP – Phase 4, Post Accreditation

- Roles
  - DAA
    - Decide to re-accreditate, IATO, or terminate
  - CA & Certification Team
    - Normally not involved, support DAA, ISSO, and system operators
  - PM
    - Cost/Schedule
    - System Documentation
  - User Representative
    - Oversee system operation
    - Report vulnerability/security incidents
    - Initiate SSAA review for change in threat or system configuration

DITSCAP – Phase 4, Post Accreditation

- Roles
  - ISSO
    - Periodically review mission statement, operating environment, and security architecture to insure compliance with SSAA
    - Maintain integrity of the site environment and accredited security posture
    - Ensure that configuration management adheres to security policy and requirements
    - Initiate C&A process when reaccredidation is required

Summary

- The system design is the easy part
- All systems are required to be accredited using DITSCAP
- DITSCAP is a long process and should not be taken lightly
- Plan adequate funding for DITSCAP

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National Center for
Energy Management and
Building Technologies

Ventilation and IAQ
The *New* ASHRAE Std 62.1

Davor Novosel, CIAQP

Chief Technology Officer

National Center for Energy Management and
Building Technologies

Sponsored by

TESTING, ADJUSTING AND BALANCING BUREAU
THE PROFESSIONAL'S CHOICE™

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Agenda

- What is and who defines IAQ?
- Why ventilate?
- Factors affecting IAQ
- ASHRAE Standard 62 today
- Basic dilution model
  - *Break*
- Ventilation rates and Ventilation Rate Procedure
- Other requirements (balancing, controls, ductwork)

Who and What Defines IAQ? /1

- There are no specific US laws or regulations
- There are only industry consensus standards
  - Definition of IAQ is a consensus statement
  - Most used definition is found in ANSI/ASHRAE Standard 62.1-2004, *Ventilation for Acceptable Indoor Air Quality*

Who and What Defines IAQ? /2

Definition of Acceptable IAQ
per ASHRAE Std 62.1-2004

"*acceptable indoor air quality*:

HEALTH — air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities

COMFORT — and with which a substantial majority (80% or more) of people exposed to not express dissatisfaction."

Why ventilate?

- Dilute contaminants
  - 6.2 Ventilation Rate Procedure
  - 6.3 Air Quality Procedure
- Dilute carbon dioxide
  - Appendix C
- Remove particulates
  - 5.9 Particulate Matter Removal (MERV 6+)
- Remove excess moisture
  - 5.10 Dehumidification Systems
- Remove excess heat
  - Outside of scope of Std 62

Ventilation Standards in US

- ANSI/ASHRAE Standard 62
  - Most widely recognized standard of care in North America
- International Mechanical Code
  - In principal based on ANSI/ASHRAE Standard 62-1999
  - Uses only prescriptive approach (Table 2 1999 version)
  - Incorporated in ICC model building code

ASHRAE Standard 62 Today

- Two standards on continuous maintenance
  - Std 62.1-2004 which address commercial & institutional spaces
  - Std 62.2-2004 which addresses residential buildings
- Additional documents in development
  - User manual for 62.1
  - Guideline for 62.1

ASHRAE Standard 62-2001

- The 2004 version is based on ASHRAE Std 62-2001 incorporates addenda
  - h, i, k, n, o, r, t, u, v, x, y, z, aa, ab, ad, ae, af

These addenda change fundamental aspects of the standard

TABB
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Addenda /1

- Major changes to the 2001 version
  - h: updates IAQ Procedure
  - i: deletes Section 4, Classification
  - k: adds Appendix K: *Application and Compliance*
  - n: rewrites *Ventilation Rate Procedures*, introduces additivity: building component+occupant component
  - o: adds Appendix I, *Guidelines For Ventilation In Smoking-permitted Areas*
  - r: adds new section 4, *Outdoor Air Quality*
  - t: clarifies issues related to liquid water in system
  - v: adds section 5.2, *Ventilation Air Distribution*
  - x: adds requirements related to indoor humidity and the building envelope

Addenda /2

- Major changes to the 2001 version (cont.)
  - y: adds new section 5.17, *Air Classification and Recirculation*
  - z: addresses air cleaning requirements for ozone (new section 6.2.1.2 *Ozone)*
  - aa: adds intake location and protection as mandatory requirement
  - ab: adds section 5.6, *Local Capture of Contaminants*
  - ad: writes new Appendix B*, Summary Of Selected Air Quality Guidelines*
  - ae: adds definitions ("cognizant authority"), adds requirements regarding air duct construction and revises Appendix D to be consistent with the revised Indoor Air Quality Procedure
  - af: implements changes to the "Purpose"and "Scope"

ASHRAE Standard 62.1-2004 /1

- Purpose of Std 62.1
  - "... to specify minimum ventilation rates and indoor air quality that will be acceptable to human occupants and are intended to minimize the potential for adverse health effects."
  - "... is intended for regulatory application to new buildings, additions to existing buildings, and those changes to existing buildings that are identified in the body of the standard."
  - "... is intended to be used to guide the improvement of indoor air quality in existing buildings."

ASHRAE Standard 62.1-2004 /2

- Scope of Std 62.1
  - "… applies to all indoor or enclosed spaces that people may occupy …"
  - "… considers chemical, physical, and biological contaminants that can affect air quality."
  - "Acceptable indoor air quality may not be achieved in all buildings meeting the requirements of this standard for one or more of the following reasons:
    - ✓ because of the diversity of sources and contaminants in indoor air;
    - ✓ because of the many other factors that may affect occupant perception and acceptance of indoor air quality, such as air temperature, humidity, noise, lighting, and psychological stress; and
    - ✓ because of the range of susceptibility in the population.

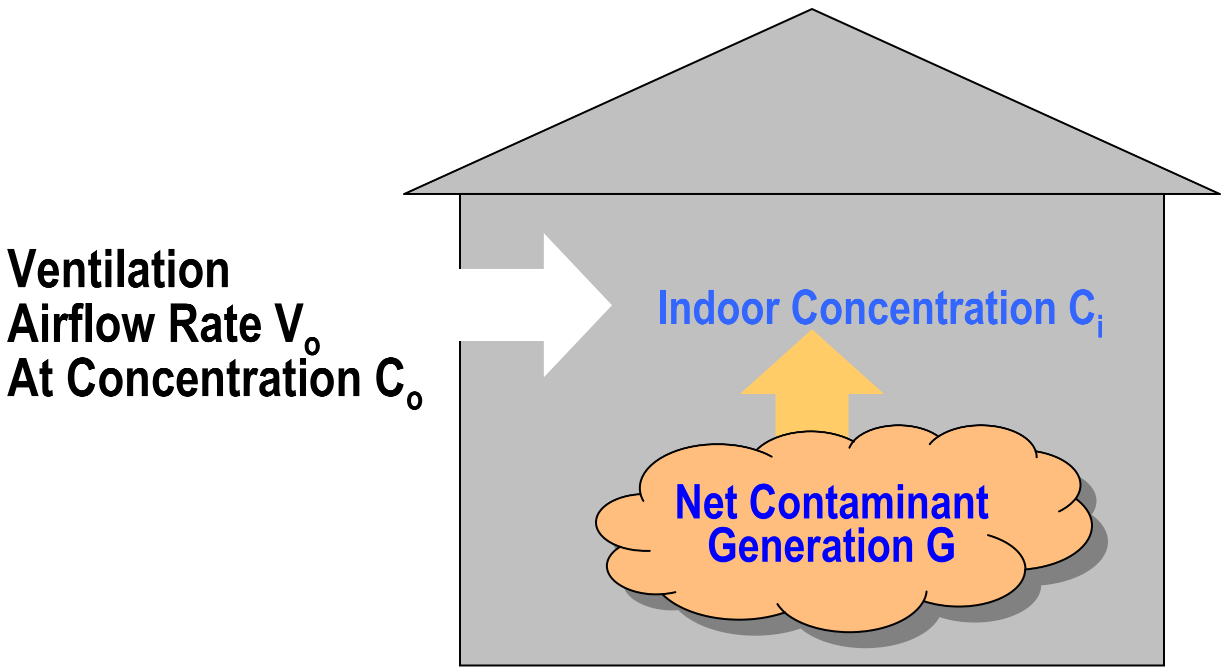
Structure of Std 62.1-2004

1. Purpose
2. Scope
3. Definitions
4. Outdoor Air Quality
5. Systems and Equipment
6. Procedures
   1. General
   2. Ventilation Rate Procedure
   3. Indoor Air Quality Procedure
7. Construction and System Start-up
8. Operation and Maintenance
9. References

Appendices

- Multi-Zone Systems
- Summary of Selected Air Quality Guidelines
- Rationale For Minimum Physiological Requirements For Respiration Air Based On CO_2 Concentration
- Acceptable Mass Balance Equations For Use With Indoor Air Quality Procedure
- Ventilation Rates for Health Care Facilities, Residential Buildings, and Vehicles
- Separation of Exhaust Outlets and Outdoor Air Intakes
- Application and Compliance

Basic Dilution Model /1



$$C_i = C_o + G / V_o$$

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Basic Dilution Model /2

$C_i = C_o + G / V_o$ .... Solved for V_o:

$$V_o = G / (C_i - C_o)$$

Indoor Source Control

Outdoor Source Control

Dilution Goal = Desired Indoor Concentration

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Basic Dilution Model /3

Desired indoor concentration derived from definition of acceptable indoor air quality

"acceptable indoor air quality: air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of people exposed to not express dissatisfaction"

Q: who defines what is harmful concentration?

Basic Dilution Model /4

… A: cognizant (health) authorities

- Issue
  - There are mandated levels (EPA, OSHA) vs.
  - Suggested and referenced levels (NIOSH, AGCIH)
- List of contaminants limited to ten
- HOWEVER, none are addressed in the Ventilation Rate Procedure; it assumes that C_i is acceptable if prescriptive rate is achieved

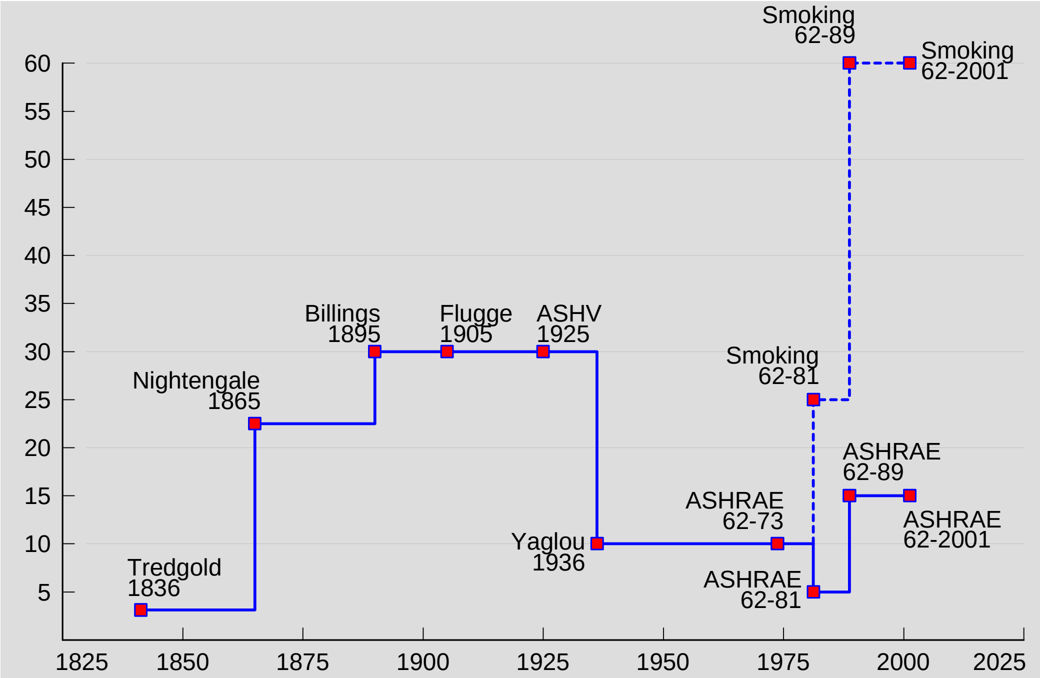
Break ...

... until 10:30

(... opportunity to visit TABB in booth 308)

Ventilation Rates /1

- Historically derived
  - Initially health governed to avoid transmittal of infectious diseases
  - Later odor (comfort) driven



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Ventilation Rates /2

ASHRAE Standard 62 has two paths to design the ventilation system, i.e., determine the ventilation rate.

- Ventilation Rate Procedure
  - A prescriptive approach based on building usage, floor area and occupancy
  - Used in almost 100% of all designs
- Air Quality Procedure
  - A design approach based on desired indoor contaminant concentration and indoor source generation rate
  - Almost never used as too little information about contamination generation is known

Ventilation Rate Procedure /1

- Prescriptive ventilation requirements
  - Based on the dilution model

$$V_o = G / (C_i - C_o)$$

  - Without quantifying C_o or G, assumes C_i is OK if prescribed outdoor airflow rate V_o is provided
  - Prescribes space (breathing zone) ventilation rates in Table 2

Ventilation Rate Procedure /2

~~Dilution model: $V_o = G / (C_i - C_o)$~~

New Std 62.1 model assumes addivity of pollution sources:

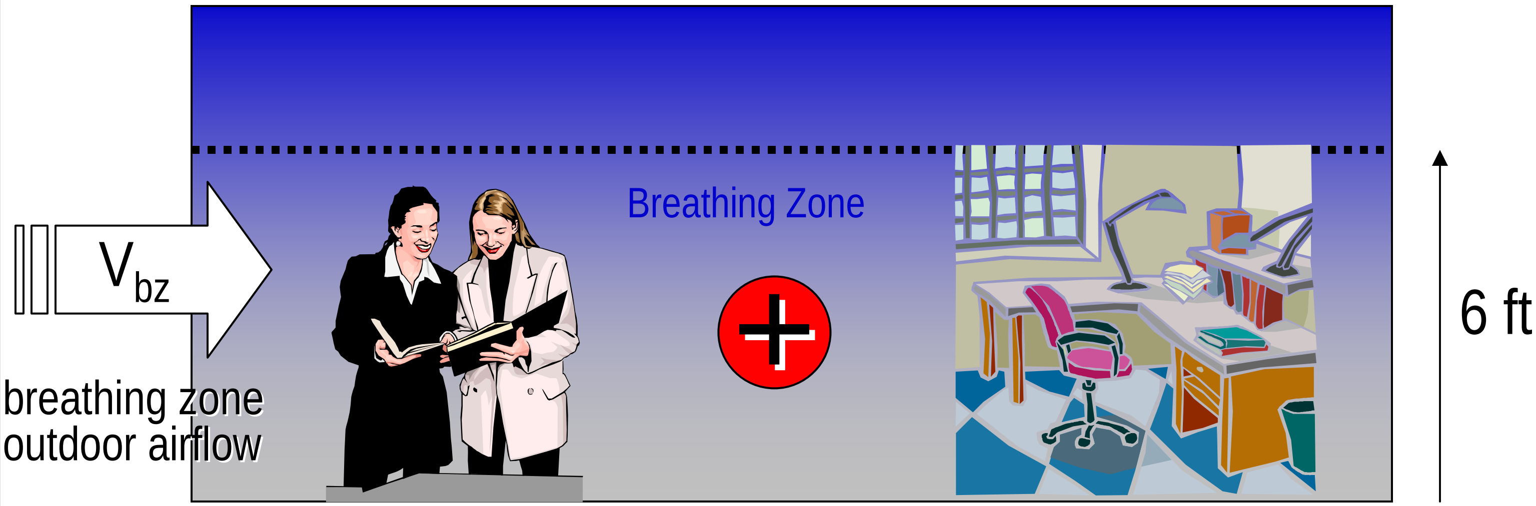
$$V_{bz} = R_p P_z - R_a A_z$$

where: $R_p P_z$ .... Source generation by occupants

$R_a A_z$ .... Source generation by building materials and furnishing

Ventilation Rate Procedure /3

New Std 62 Model: $V_{bz} = R_p P_z + R_a A_z$



R_p: OA airflow rate per person
P_z : zone population

R_a: OA airflow rate per unit area
A_z : zone floor area

- New Table 2 prescribes rates (R_p cfm/p, R_a cfm/f²)

Ventilation Rate Procedure /4

Excerpt from new Table 2

Occupancy Category	People Outdoor Rate R_p	Area Outdoor Rate R_a	Occupant Density	Combined Default Value	62-2001 Value	Air Class
	cfm/person	cfm/ft²	# / 1000 ft²	cfm/person	cfm/person	
Office space	5	0.06	5	17	20	1
Daycare (through age 4)	10	0.18	25	17	15	2
Classroom (age 5-8)	10	0.12	25	15	15	1
Classroom (age 9 plus)	10	0.12	35	13	15	1
Lecture classroom	7.5	0.06	65	8	15	1
Media center	10	0.12	25	15	--	1
Music/theater/dance	10	0.06	35	12	15	1
Restaurant dining rooms	7.5	0.18	70	10	20	2
Auditorium seating	5	0.06	150	5	15	1
Libraries	5	0.12	10	17	15	1

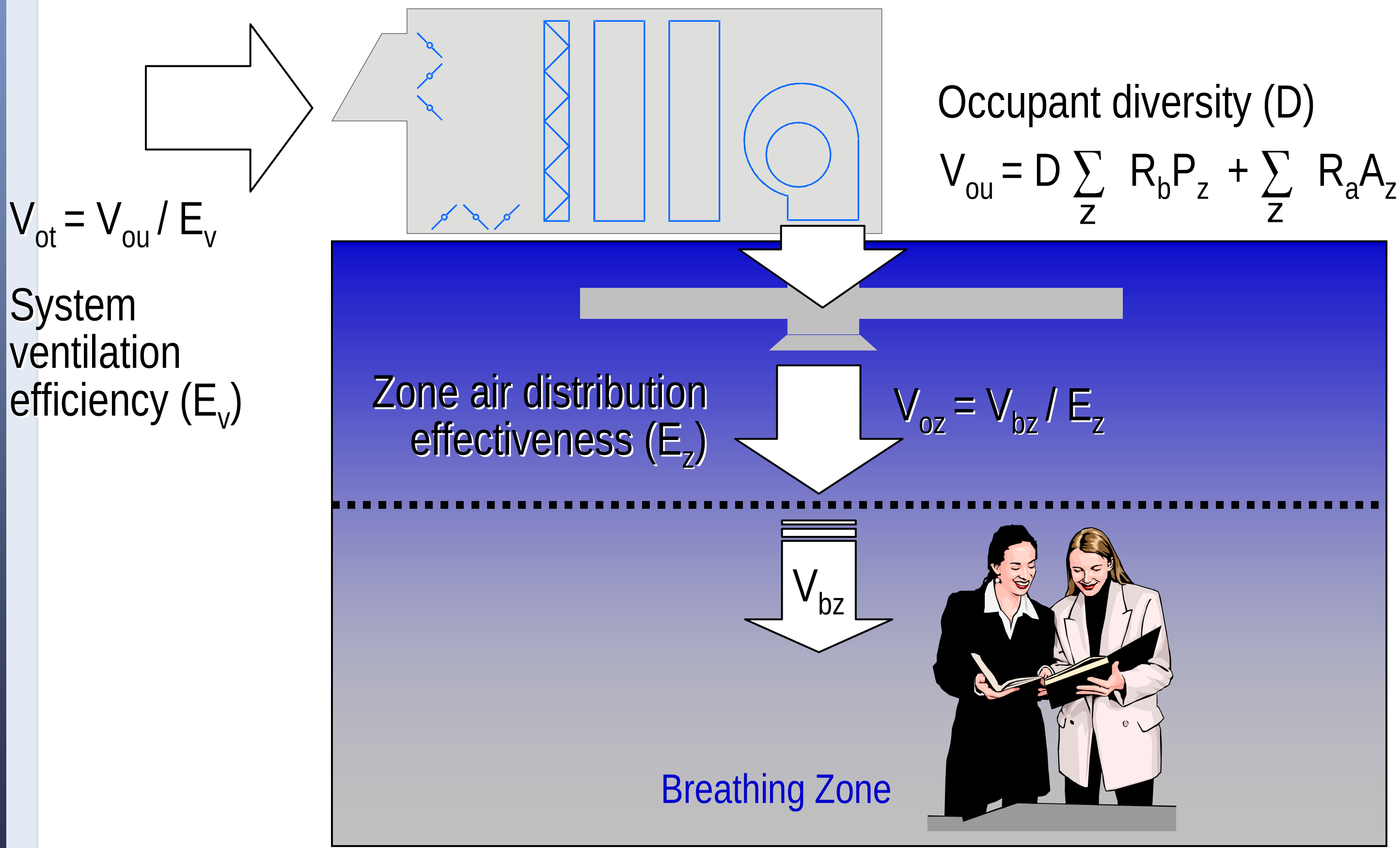
TABB TESTING, ADJUSTING AND BALANCING BUREAU THE PROFESSIONAL'S CHOICE™

Ventilation Rate Procedure /5

- Factors affecting delivery of outdoor air to the breathing zone
  - Zone air distribution effectiveness (E_z) (Table 6-2)
  - System ventilation efficiency (E_v) (Table 6-3)
  - Occupant diversity (D)
    - ✓ Defined as D = $P_s \sum P_z$

where P_s = system population (peak)

Ventilation Rate Procedure /6



Ventilation System Control

Ventilation system ...

- Must include controls
- Must maintain minimum outdoor airflow under any load condition
  - VAV system with fixed outdoor air damper must comply with this at minimum supply airflow
  - Air balancing is crucial (TABB)

Ventilation Air Distribution

5.2.1 Designing for Air Balancing

"The ventilation air distribution system shall be provided with means to adjust the system to achieve at least the minimum ventilation airflow as required by Section 6 under any load condition."

- Include air balancing professional (TABB) in design stage

Varying Operating Conditions

If short-term conditions vary significantly (occupancy, ventilation rate), design may be based on average conditions over period T

$$T = 3v / V_{bz}$$

where: v …. Volume of the zone for which averaging is being applied

V_{bz} .. Breathing zone outdoor airflow

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Dynamic Reset

Design may reset outdoor air intake flow (V_{ot}) and/or zone airflow as operating conditions change

- Measures of estimating variations in occupancy
  - Occupancy schedule
  - Direct count of occupants
  - CO_2 sensing
- Variations in distribution efficiency
- Economizer operation

Air Duct System Construction

- Section 7.1.5
  "Air duct systems shall be constructed in accordance with the following standards, as applicable:"
  - SMACNA *HVAC Duct Construction Standards – Metal and Flexible*
  - SMACNA *FIBROUS Glass Duct Construction Standards*
  - NFPA Standards for Installation of Air-Conditioning and Ventilating Systems, NFPA 90A
- Include air balancing professional (TABB) in design stage

Air Balancing

- Section 7.2.2

  "… shall be balanced in accordance with ASHRAE Standard 111, SMACNA's *HVAC Systems – Testing Adjusting and Balancing* or equivalent … to verify conformance with the total outdoor air flow and space supply air flow …"
- Air balancing is crucial (TABB) to achieve and verify ventilation rates
- Consider continuous commissioning to maintain building operation at optimal, i.e., verify air balance on a periodic basis (TABB)

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TABB
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An Open Channel Screening Selection Guide

Duperon® Corporation

Sarah Bernier
Mike Woodley

An Open Channel Screening Selection Guide

Intention:

- To give general information for the design and selection of barscreen equipment available in today's marketplace.

Outcome:

- Successful implementation of best practices and screening selection guide to design the optimal configuration for your application.

Definitions

What do we mean by screening equipment?

- Raking device used to remove debris from water and is usually used to protect downstream process equipment.

- Also known as:
  - Self-Cleaning Trashracks
  - Trashrakes
  - Mechanically Cleaned Barscreens
  - Automated Barscreens

Definitions cont'd

- Headloss:
  - The difference in water level between the upstream and downstream sides of a screen.
- Slot Velocity:
  - The speed in which water travels through barscreen.
- Approach Velocity:
  - The speed in which water travels prior to meeting the barscreen.

Equipment Selection Criteria

- Overall Objective
- Financial
- Debris Conditions
- Site Configurations
- Design Impacts
- Federal, State, and Local Legislature

Applications in Open Water Channels

- Flood Control
- Stormwater Management
- Irrigation
- Industrial Cooling Towers
- Hydroelectric
- Nuclear Power Plants
- Fish Screens

Best Practices for Design

- In a pump station, the main objective is to maintain consistent peak flow to run at capacity.
- Slope in the channel increases velocity
- In a storm event, most debris will hit your screen within one hour

Best Practices for Design Cont'd

- Try to use original floor in open water channels – otherwise unforeseen sedimentation issues may arise.
- Channel erosion on an earthen bank will occur if slot velocities reach 6 foot/second

Tips for Debris

- If you can avoid bringing debris to the bank, than removal may not be your responsibility.

- Use conveyance systems to discharge debris where it can dry out & reduce removal costs.

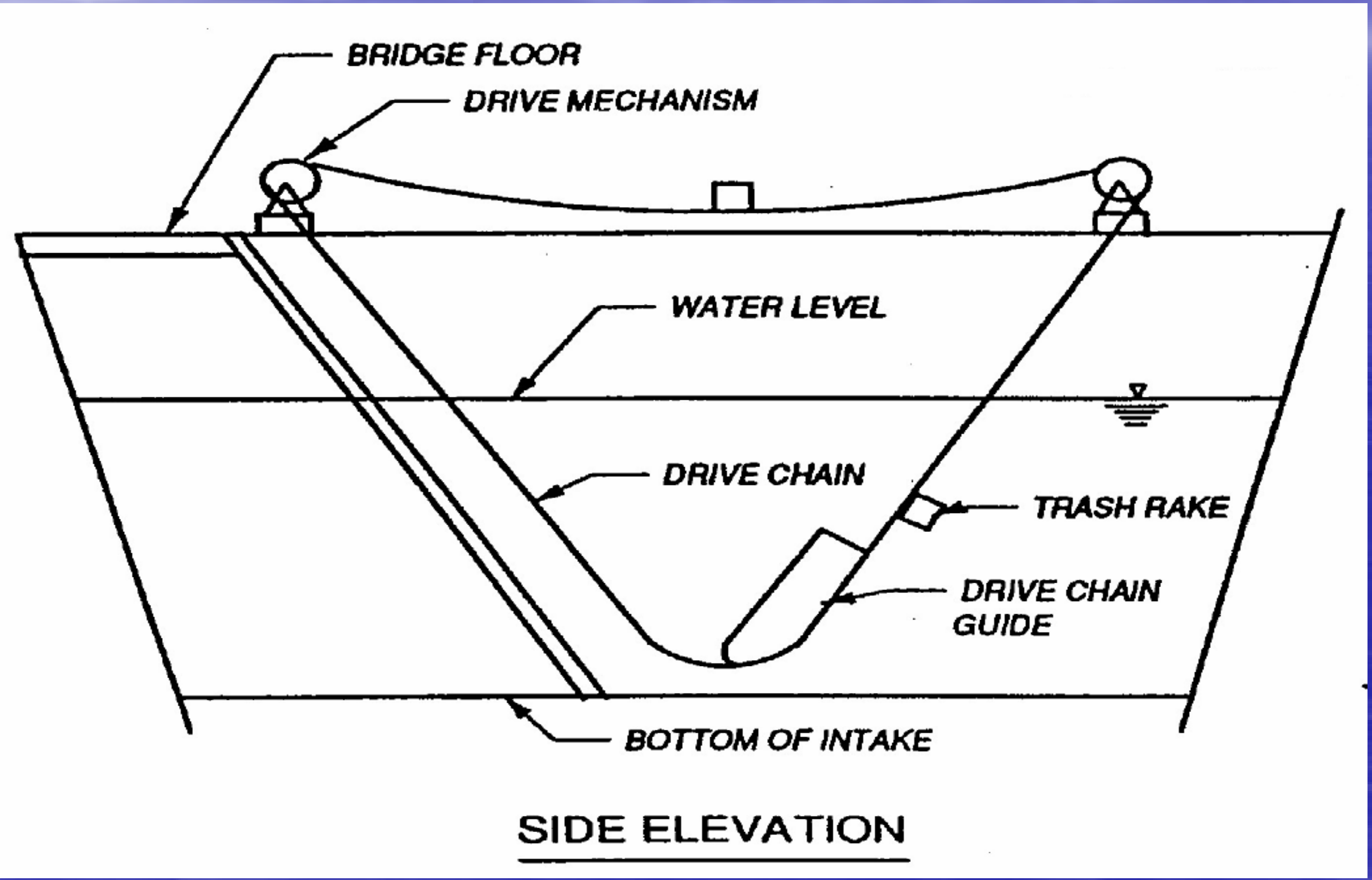
- Drums & unidentifiable debris must be investigated for hazardous materials.

Four Main Barscreen Classifications

Barscreen Classifications

- **CATENARY**
- **CABLE HOIST**
  - Guided
  - Unguided
- **MECHANICAL**
  - Climber Trashrakes
  - Chain Driven
  - Elbow Arm
- **TRAVELING WATER SCREENS**

Catenary Barscreens



Courtesy of USACE EM1110-2-3102

Catenary Barscreens

Catenary Barscreens

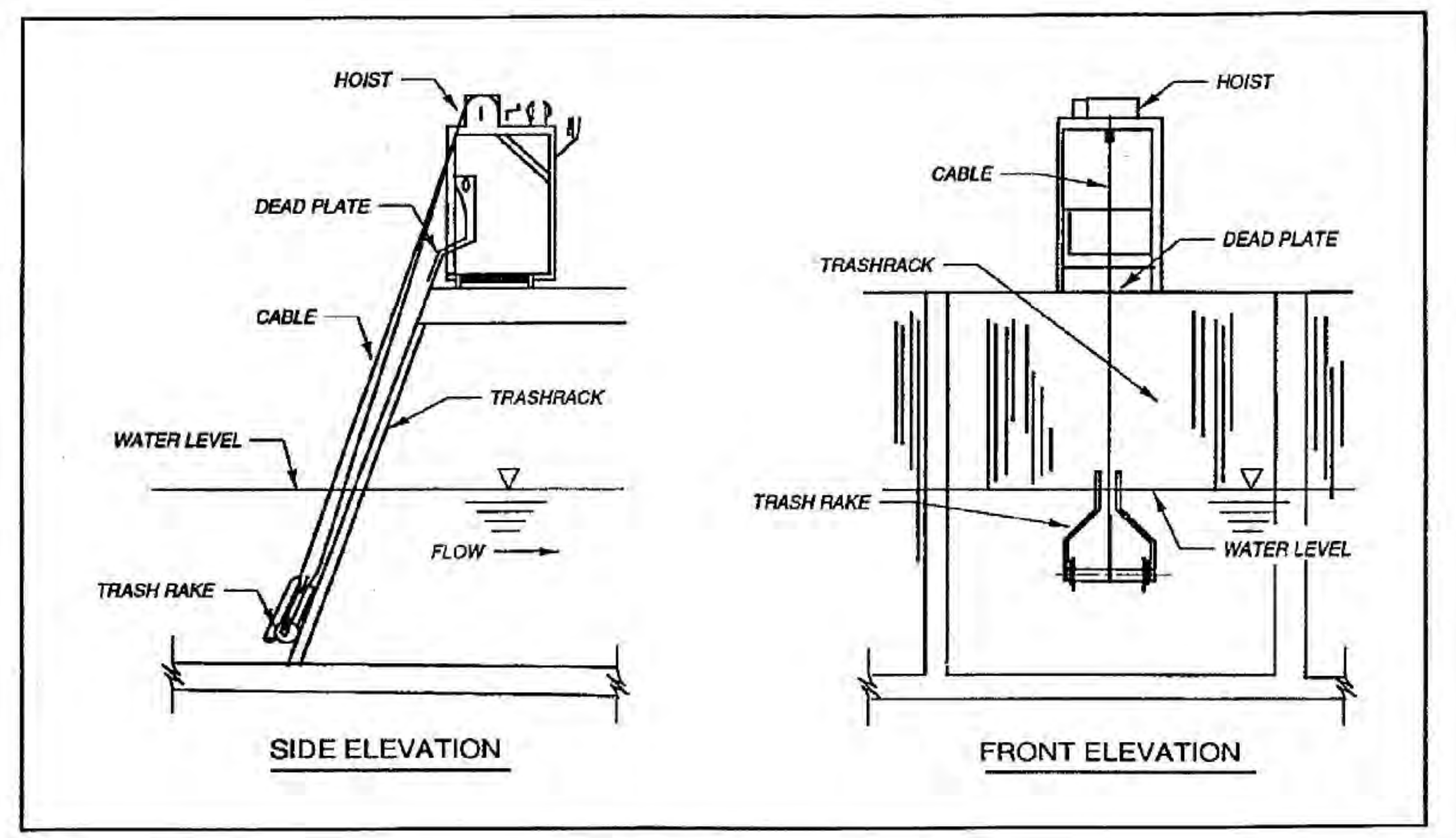
ADVANTAGES:

- No lower sprockets
- Economical
- Dewatering is not necessary for installation

DISADVANTAGES:

- Cannot remove large debris in front of rake
- Susceptible to damage during severe weather conditions
- Rake will jam if scraper hits projections
- Large footprint on deck

Cable Hoist Barscreens



Courtesy of USACE EM1110-2-3102

Cable Hoists

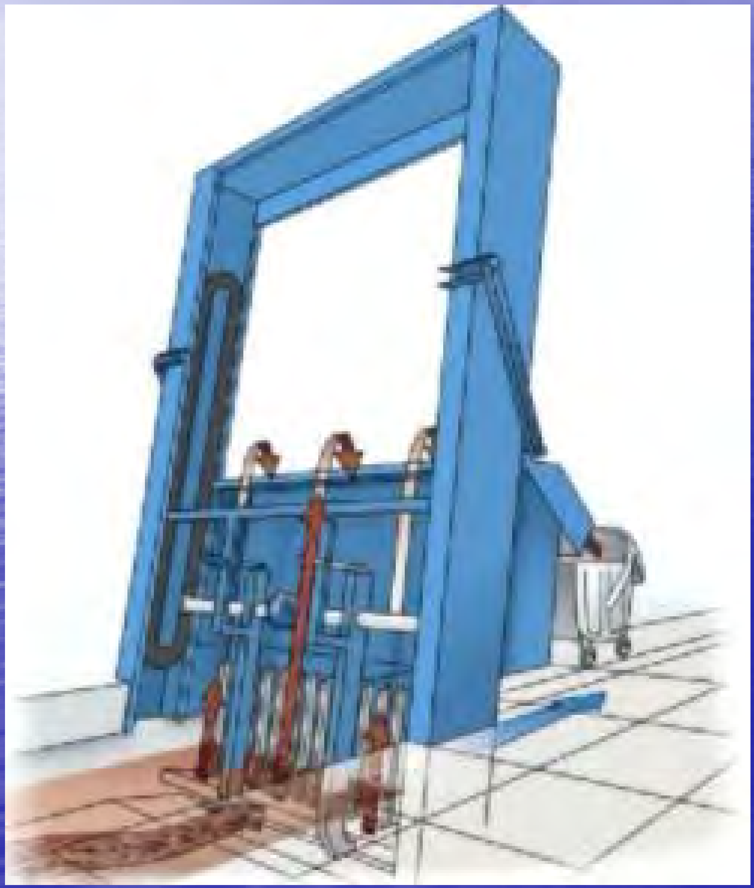
ADVANTAGES:

- Can be raked manually if there is a mechanical breakdown
- Handles relatively large debris
- Cost effective for large screening areas
- Deck space used is minimal
- Dewatering is not necessary for installation

DISADVANTAGES:

- Susceptible to damage during severe weather conditions
- Tends to lose debris on the way up
- Maintenance

Mechanical Climber Barscreens



ADVANTAGES:

- All maintenance components above deck
- Fully automated

Mechanical Climbers Cont'd

DISADVANTAGES:

- High profile
- If large debris is at the bottom of water, the rake will not enter the screen
- Complicated controls
- Cannot manually rake in the event of mechanical breakdown
- Long cycle times

Mechanical Chain Driven Barscreen

ADVANTAGES:

- Rake is spring loaded to allow the rake to pass over any lodged objects or obstructions
- Handles high debris loadings

DISADVANTAGES:

- Sprockets are susceptible to jamming and pinching points
- Wearing mechanical parts below water

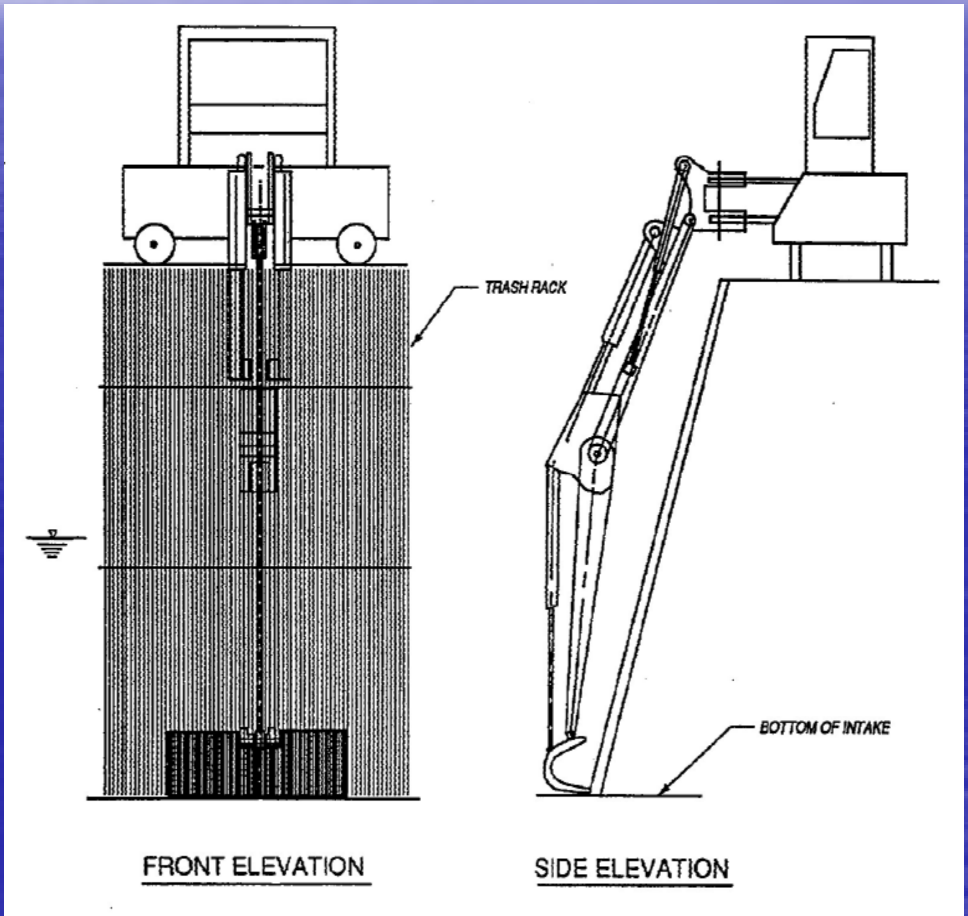
Mechanical Elbow Arm Barscreen

ADVANTAGES:

- Better span
- Can remove large debris

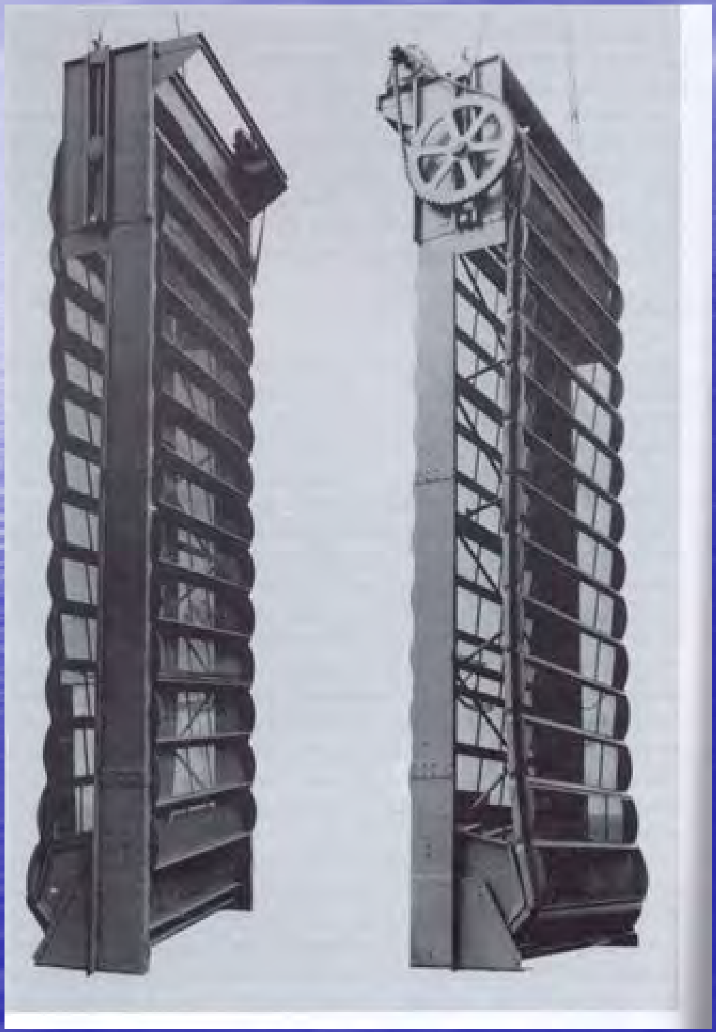
DISADVANTAGES:

- Must be manually operated
- Lower debris removal capacity than stationary screen



Courtesy of USACE EM1110-2-3102

Traveling Water Screens



- Most common type of intake screens in the United States
- Typically protected by coarse screens upstream
- Fine openings – 1/8” to 3/4”
- Three types

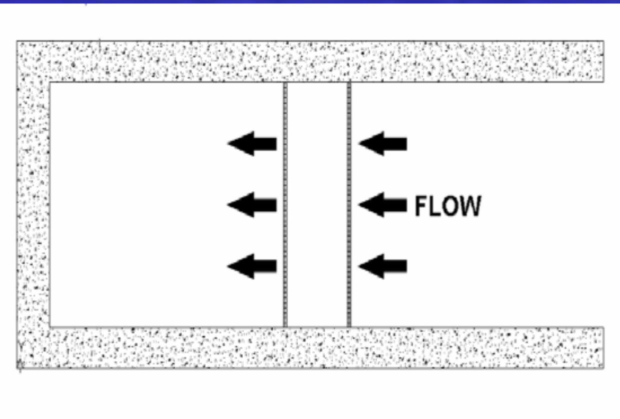
Thru Flow Traveling Water Screen

ADVANTAGES

- Utilize 80%-90% channel width as effective screening area
- Reduce construction and equipment cost

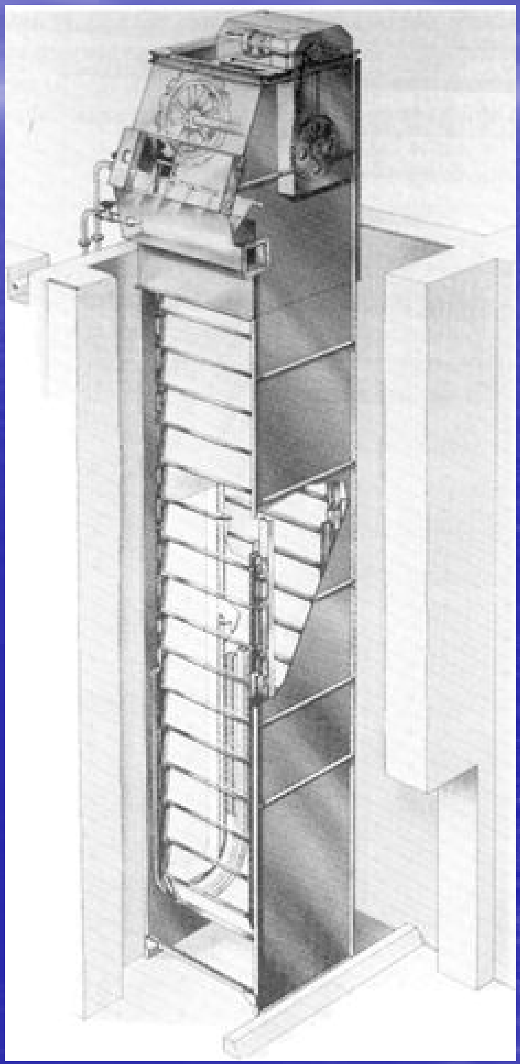
DISADVANTAGES

- CARRYOVER
- Spray Wash System
- Higher Operating & Maintenance Costs

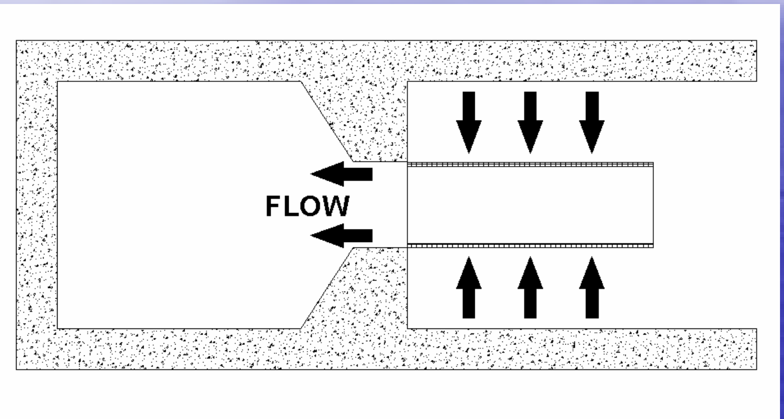


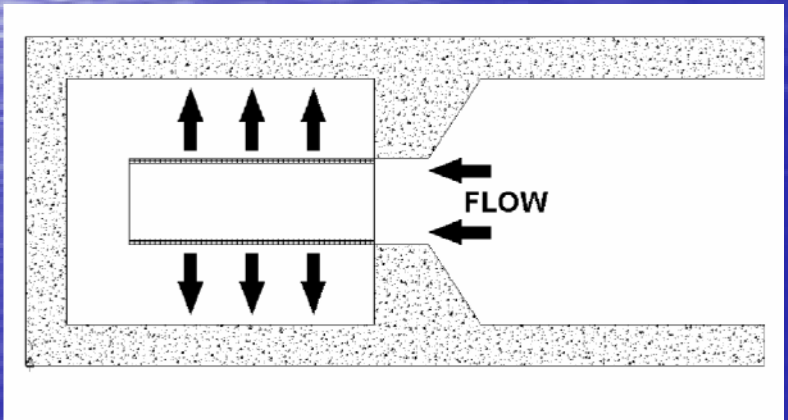
Dual Flow & Center Flow Traveling Water Screens

- <u>ADVANTAGES</u>
- Passes twice as much water as Thru Flow at the same velocity
- Entire submerged screen surface is utilized as active screen area
- Virtually eliminates carryover problem
- Design lends to finer meshes



Dual Flow & Center Flow Traveling Water Screen





DISADVANTAGES:

- Increased construction costs
- Requires careful hydraulic consideration
- Descending trays full of debris block the screen for rest of cycle
- Resulting in higher, more frequent headloss conditions

In Conclusion

- Screening Selection Criteria
- Best Practices
- Main Barscreens in the Marketplace

Are there any questions?

Thank you for your time.

If you have any questions, please feel free to contact us at Duperon Corporation 800.383.8479

US Army Corps
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St. Paul District

Red River of the North at East Grand Forks, MN & Grand Forks, ND

Flood Control Project – Armada of Pump Stations Protect Both Cities

Timothy Paulus, PE

Mechanical Engineer

USACE St. Paul District

August 2005 Infrastructure Conference

US Army Corps of Engineers
St. Paul District

GF & EGF Flood Control Project Pumping Stations

Presentation Summary

- ✓ Project location
- ✓ 1997 flood
- ✓ Project background
- ✓ Pump station design
- ✓ Pumps
- ✓ Generators
- ✓ Controls
- ✓ Questions

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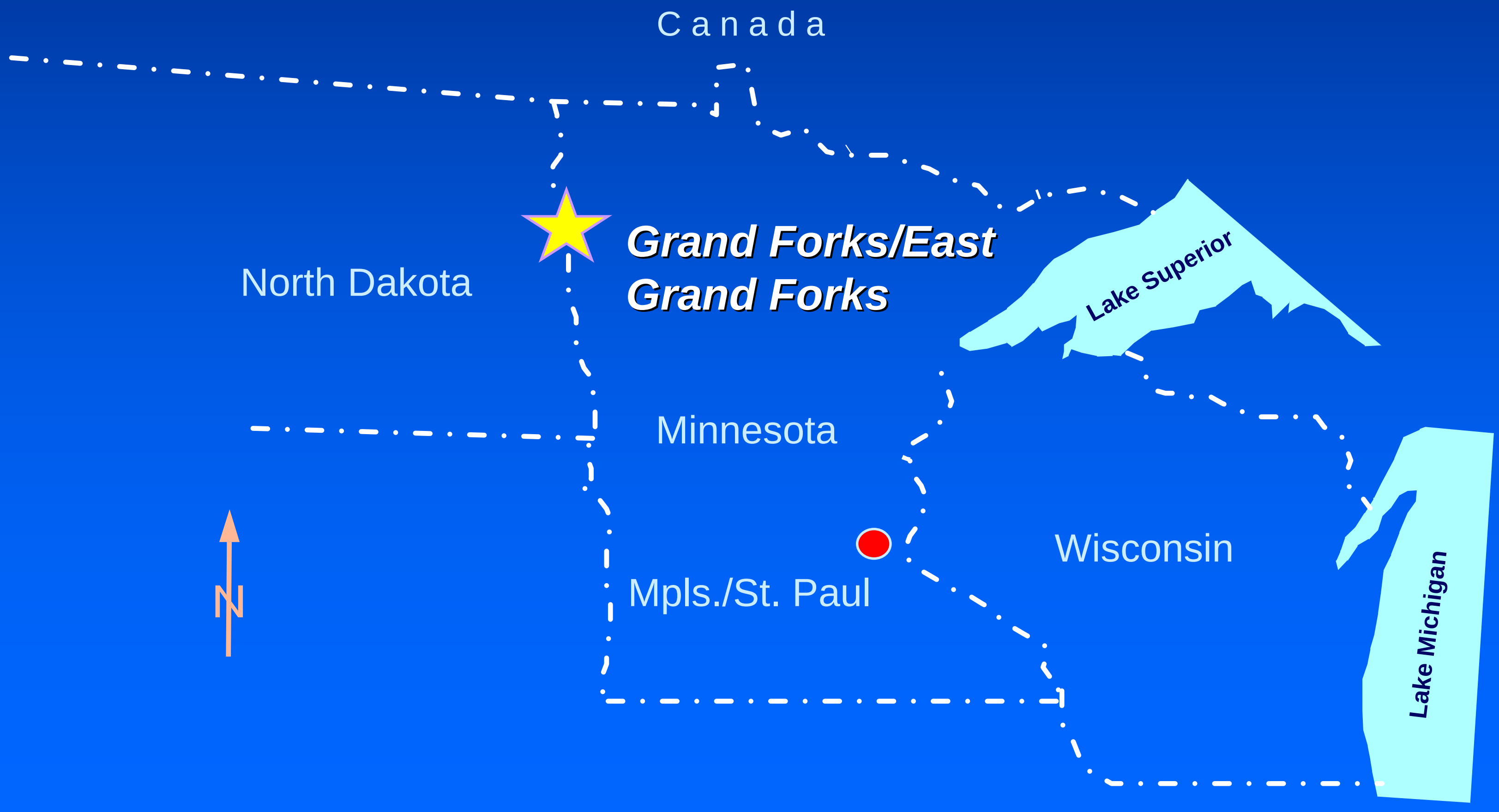
GF & EGF Flood Control Project Pumping Stations

Project Location



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GF & EGF
Flood Control Project
Pumping Stations

1997 Flood

- ✓ Greatest flood on record for this area
- ✓ 50,000 people evacuated
- ✓ Both Grand Forks and East GF under water
- ✓ Ice storm knocked out power to each City
- ✓ Major blizzard
- ✓ Several buildings in Grand Forks burned
- ✓ Over $1 Billion in damages

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Flood Control Project
Pumping Stations

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Downtown Grand Forks 1997 Flood

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GF & EGF Flood Control Project Pumping Stations

Grand Forks Lincoln Park 1997 Flood

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GF & EGF Flood Control Project Pumping Stations

Project Background

- ✓ Project started after 1997 flood
- ✓ Multiple construction contracts
- ✓ One project: Grand Forks & East Grand Forks
- ✓ $400 Million cost
- ✓ Completion in 2007 – 10 year anniversary of 1997 Flood
- ✓ 23 Pump Stations (12 GF and 11 EGF)
- ✓ Ring levees around each City
- ✓ 40 miles of levee total
- ✓ 3 miles of floodwall

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GF & EGF Flood Control Project Pumping Stations

Pump Station Design

- ✓ 23 Stations – Optimization and Cost Analysis
- ✓ Size from 6000 GPM to 112,000 GPM
- ✓ English Coulee largest station (GF side)
- ✓ Balance number of stations versus capability of each City to operate and maintain them
- ✓ Pump, control & generator supply contracts
- ✓ Each City wanted superstructures & generators. Lessons learned 1997 flood.
- ✓ Heating and maintaining buildings
- ✓ Maintenance and consistency between stations critical – spare parts

GF & EGF Flood Control Project Pumping Stations

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Downtown East Grand Forks Station

GF & EGF Flood Control Project Pumping Stations

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Grand Forks Elmwood Drive Station

GF & EGF Flood Control Project Pumping Stations

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Grand Forks English Coulee PS (-40F)

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GF & EGF Flood Control Project Pump Stations

Pumps

- ✓ Purchased under supply contract
- ✓ KSB submersible storm water pumps
- ✓ Pumps installed on guide rails
- ✓ Hoist system provided for pump removal
- ✓ Interior Flood Control Analysis Optimization
- ✓ Settled on 3 Pump Sizes
- ✓ English Coulee Station utilizes vertical pumps
- ✓ Farval automatic lubrication system
- ✓ Use compressed air system for filling Farval lubricators

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GF & EGF Flood Control Project Pumping Stations

KSB Submersible Pumps

GF & EGF Flood Control Project Pumping Stations

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Vertical Pumps at English Coulee PS

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GF & EGF Flood Control Project Pump Stations

Generators

- ✓ Purchased under supply contract with Onan
- ✓ Automatic transfer switches
- ✓ Skid mounted fuel tanks and 24 hr operation
- ✓ Fuel tanks double wall construction
- ✓ Alarm system tied into SCADA. Limit data sent back to master station.
- ✓ Need to be operated monthly
- ✓ Load banks built Into exhaust ductwork and sized at 50% of generator capacity
- ✓ Winter operation

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GF & EGF Flood Control Project Pumping Stations

250 KW Generator

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500 KW Generator English Coulee

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100 KW Generator, Fuel Pipe, & Exhaust

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GF & EGF Flood Control Project Pumping Stations

Detail of Exhaust Duct and Load Bank

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St. Paul District

GF & EGF Flood Control Project Pumping Stations

Controls

- ✓ Supply contract with SCIPAR
- ✓ Individual Motor Starters
- ✓ Incorporates SCADA and Telemetry
- ✓ Radio system
- ✓ Central computer at each City
- ✓ Transducers for measuring water levels
- ✓ No Remote Operation – We want operators at each station
- ✓ Data overload – Limit what is sent
- ✓ Programming issues – Training for each City

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GF & EGF Flood Control Project Pumping Stations

Starter Panels 6000 GPM Pumps

GF & EGF Flood Control Project Pumping Stations

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SCIPAR Control Panel

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SCIPAR Control Panel at English Coulee

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GF & EGF Flood Control Project Pump Stations

Questions or Comments?

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Basic Design Considerations for Geothermal Heat Pump Systems

2005 Tri-Service Infrastructure Systems Conference and Exhibition

Gary Phetteplace

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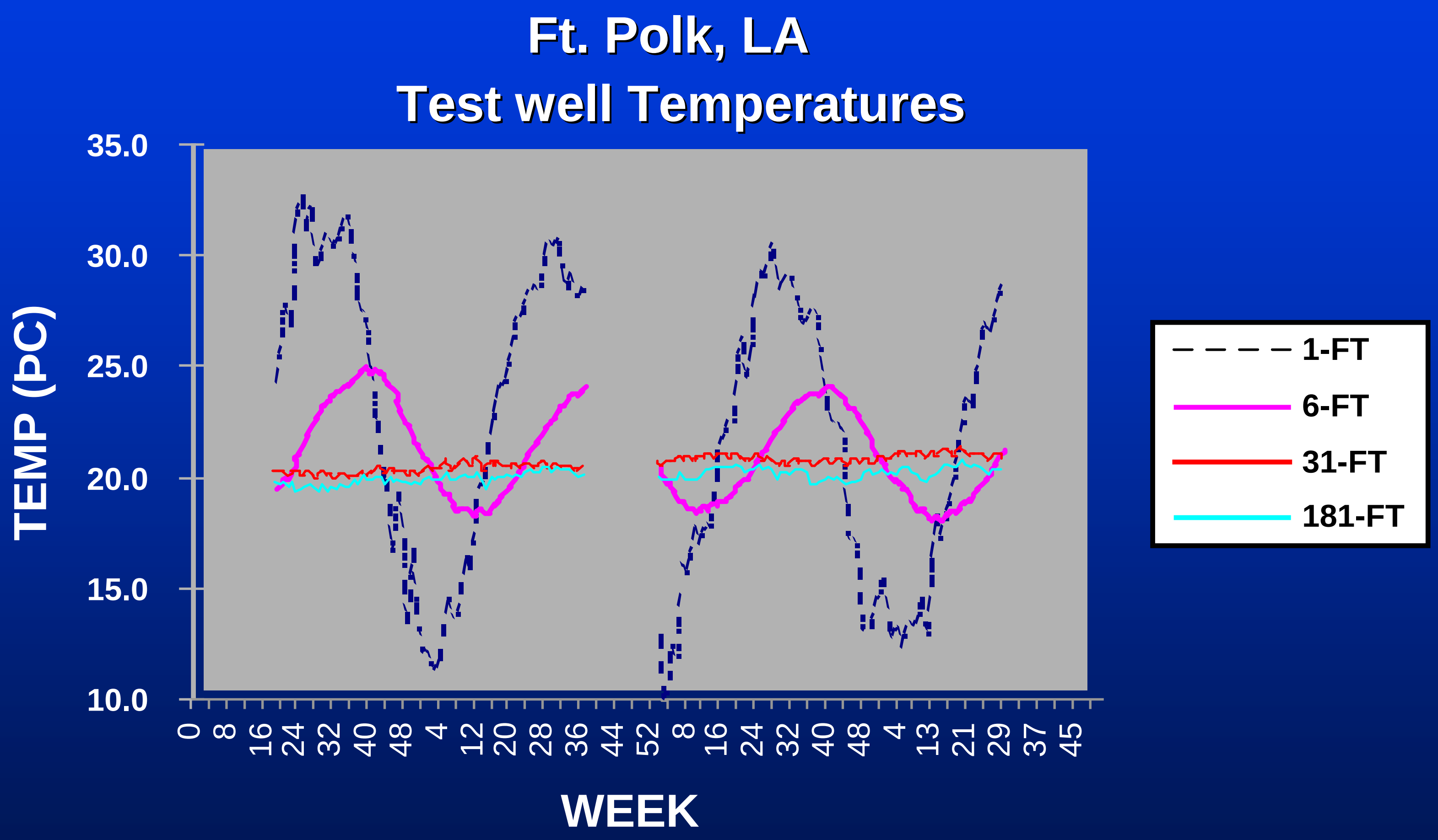
Outline for today

- Motivation for GSHP's
- Types of systems
  - Major system types
  - Summary of advantages and disadvantages
- Building heat loads and heat pump selection
- Design of ground-coupling
  - Design software
  - Other ground loop considerations
- Other system design issues
  - Pumps and piping
  - Ventilation air
  - Cost control
- How to stay out of trouble
- References

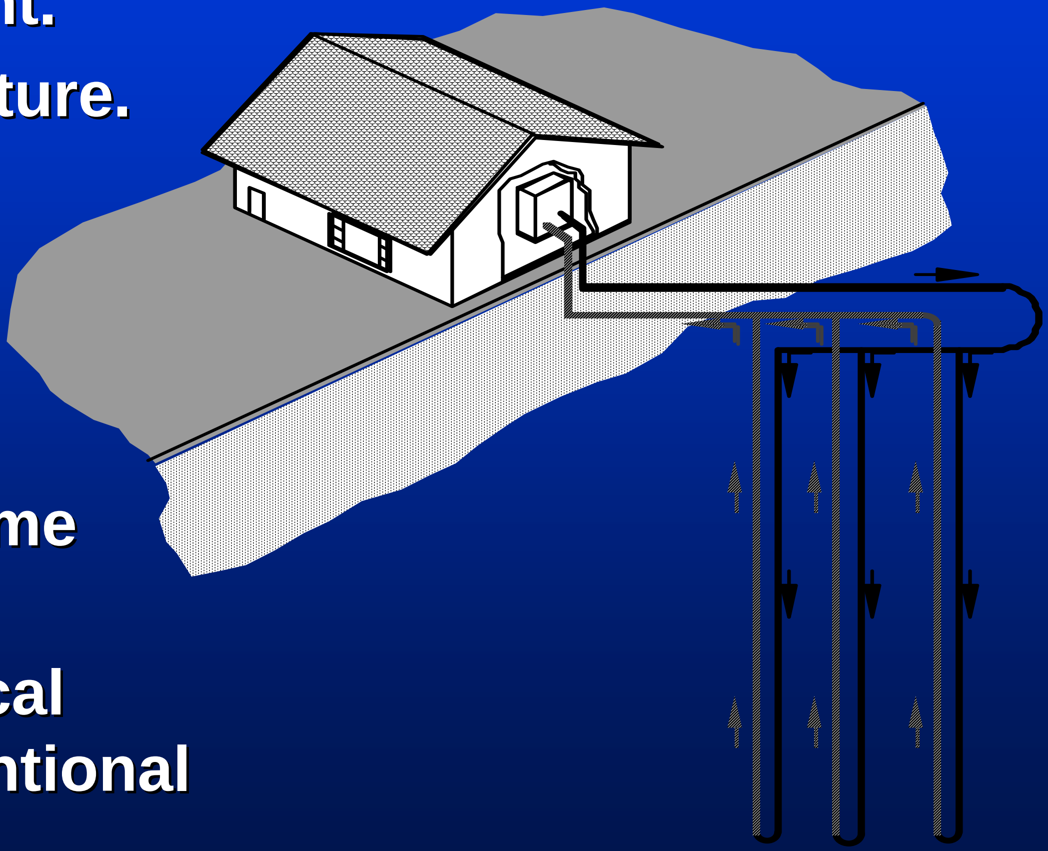
Why Use the Ground As a Heat Source/Sink?



Basic System Types

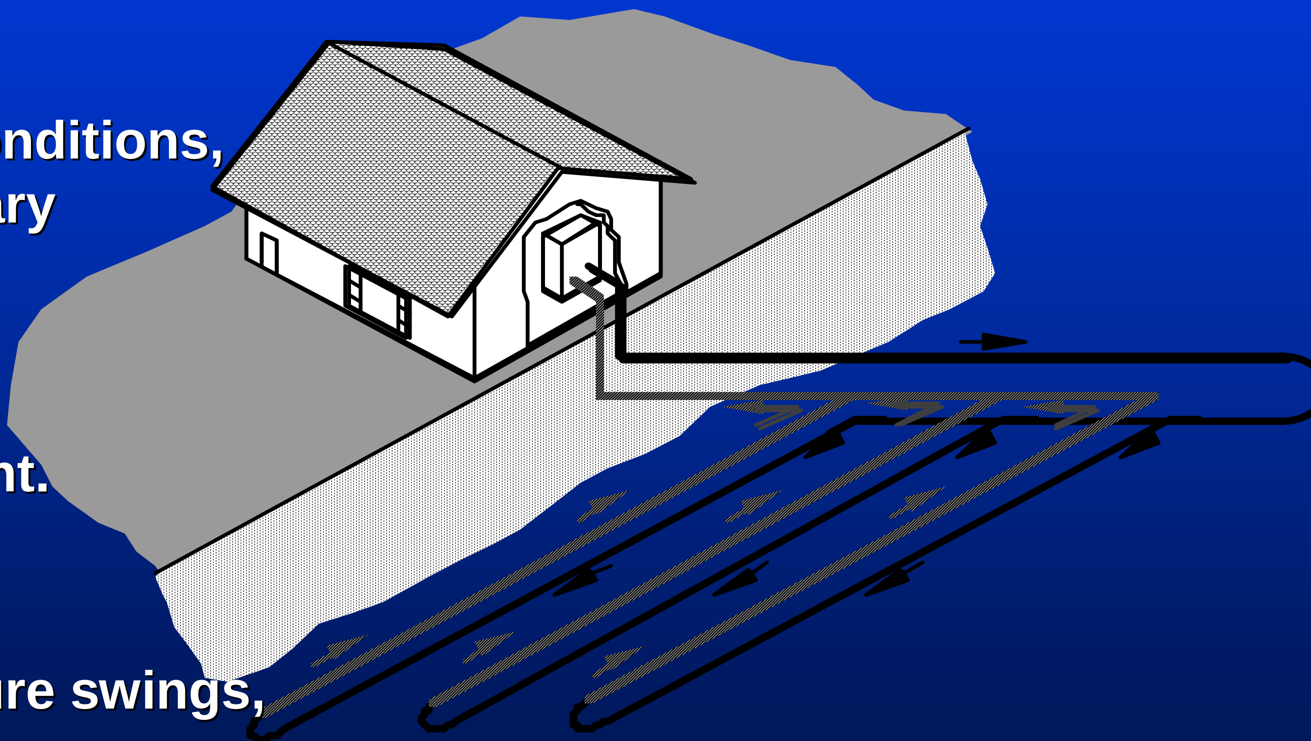
CLOSED LOOP
Vertical Ground Coupled

- **Advantages**
  - low land area requirement.
  - stable deep soil temperature.
  - adaptable to many sites.
- **Disadvantages**
  - high cost.
  - does not work well in some geological conditions.
  - needs experienced vertical loop installer, not conventional well driller.



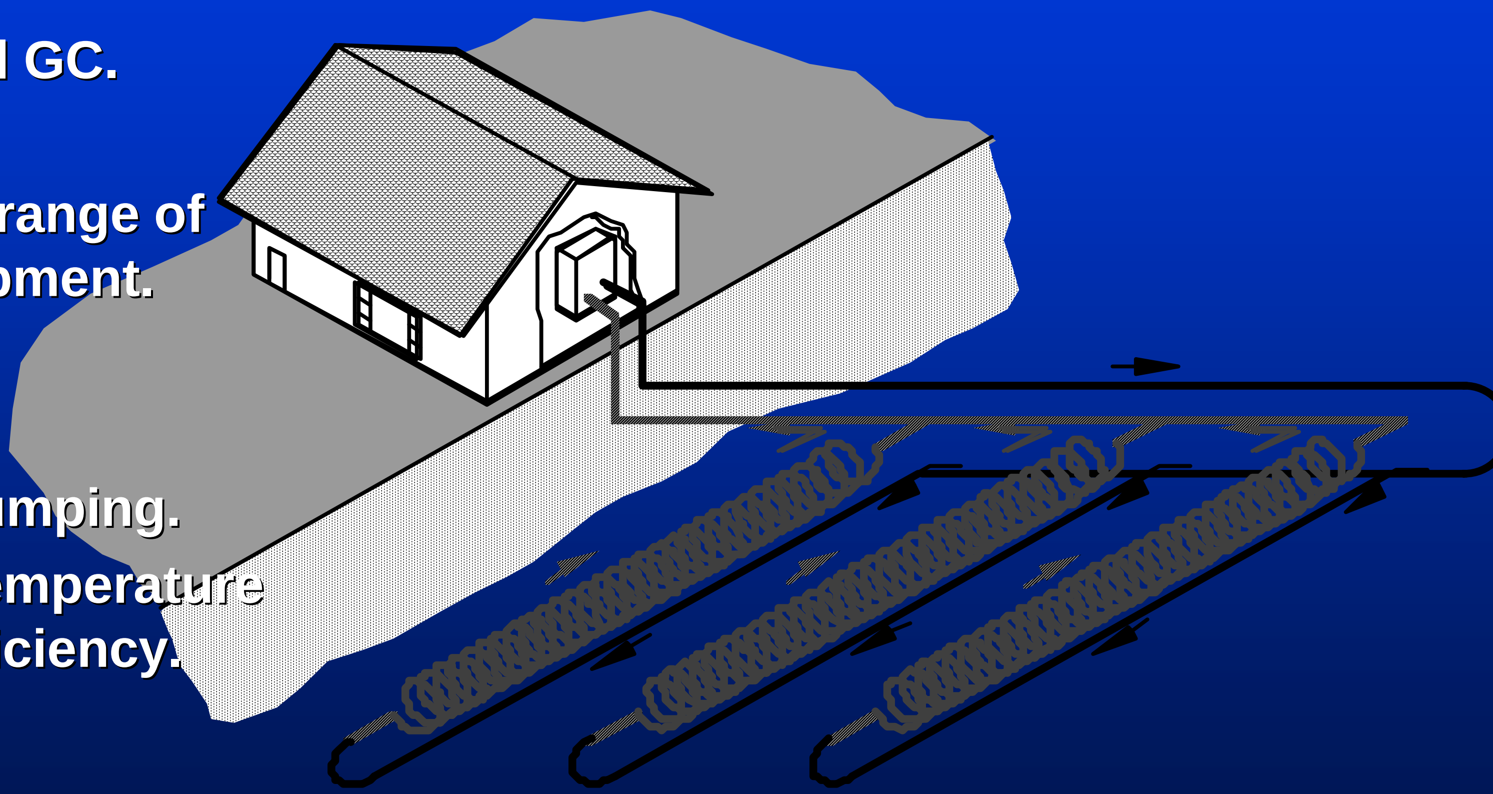
CLOSED LOOP
Horizontal Ground Coupled

- Advantages
  - lower first cost.
  - less special skills.
  - less uncertainty in site conditions, but soil conditions can vary seasonally.
- Disadvantages
  - high land area requirement.
  - limited potential for HX w/groundwater.
  - wider seasonal temperature swings, lower efficiency.



CLOSED LOOP
Slinky Ground Coupled

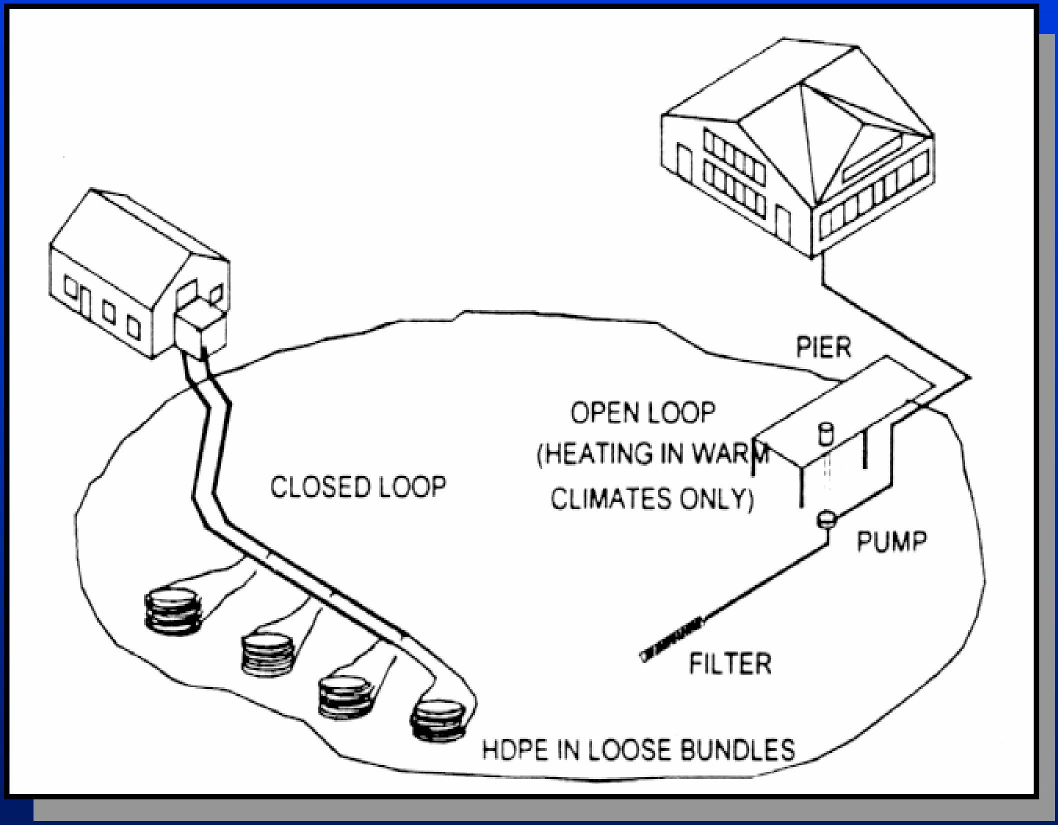
- Advantages
  - those of horizontal GC.
  - but less land area.
  - adaptable to wide range of construction equipment.
- Disadvantages
  - lots of pipe and pumping.
  - widest seasonal temperature swings, lowest efficiency.



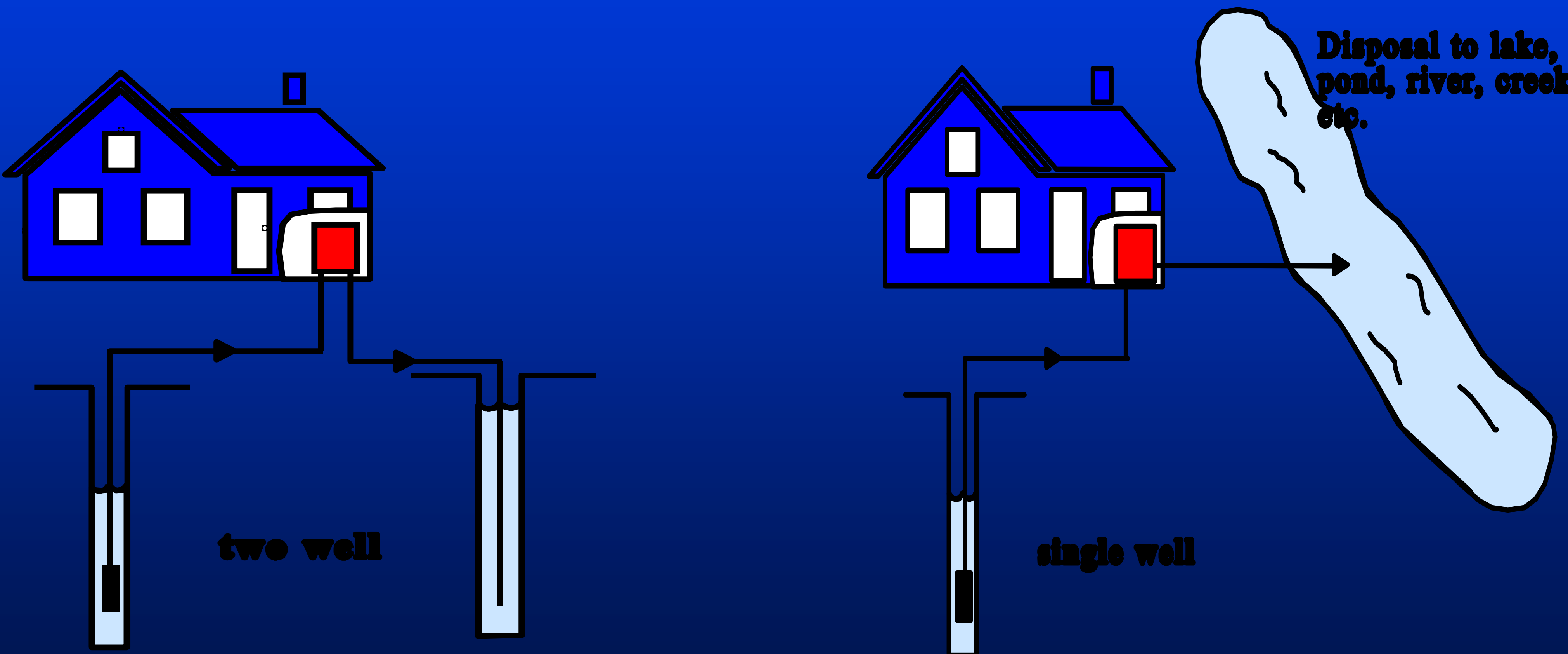
Surface Water Systems

- Advantages
  - Low first cost
  - Direct cooling may be possible

- Disadvantages
  - Fishermen
  - Wide seasonal temperature swings
  - Commercial-scale systems require significant water bodies



OPEN LOOP
Ground Water



Open loop ground water system

- Advantages
  - Lowest first cost, especially for large loads
  - Stable source temperature, high efficiency
  - Some direct cooling possible
  - Oldest, most commonplace
- Disadvantages
  - Environmental requirements
  - Site specific
  - Poor water quality can cause difficulties

Summary of Ground-Source vs Conventional Systems

- **GSHP Advantages**
  - Ideal zone control
  - Simple, highly reliable controls and equipment
  - Low operating cost
  - Low maintenance
  - Less floor area requirements
  - No on site fuel
  - Green technology
  - Heat recovery hot water heating possible
- **GSHP Disadvantages**
  - Higher first costs compared to some systems
  - Experienced designers and design guidance limited
  - Installation infrastructure regionally inadequate

Building Loads and Heat Pump Selection

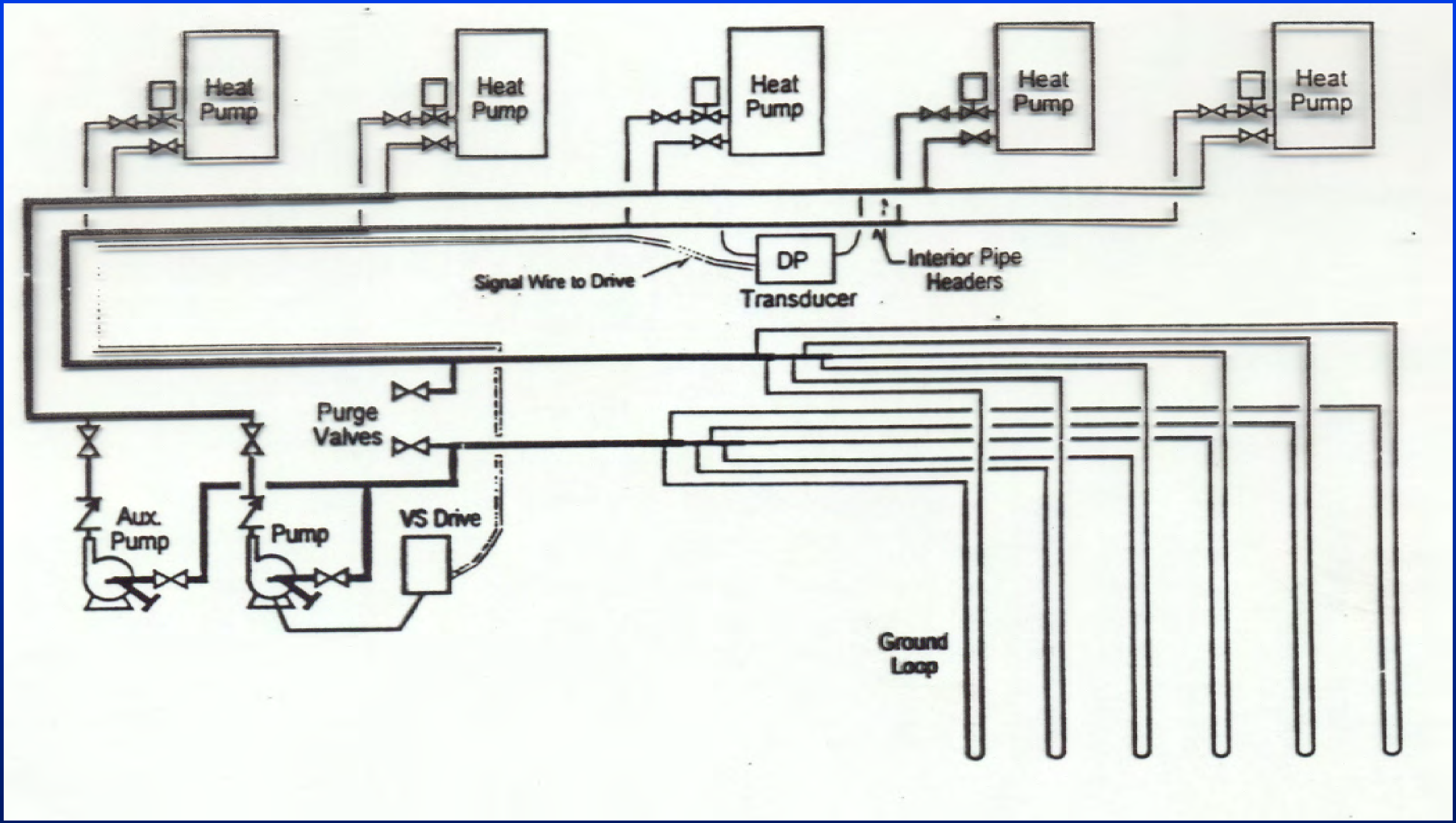
Building Loads and Heat Pump Selection

- A wide variety of heat pump configurations and sizes are available
- No more than one zone per heat pump is usually best
- Bigger equipment is normally not better
  - Smaller units usually have higher efficiencies
  - Larger units have little cost advantage. Often ducting costs will offset any advantage

Building Loads and Heat Pump Selection

- Three principal options for configuration of ground-coupling:
  - Common circulating loop, best for compact floor plans
  - Separate ground-coupling for each heat pump, best for some retrofit situations and spread-out buildings like schools
  - Some combination of these two approaches

Central System



•Do not worry that flow in loops goes laminar at low flow.

•VSD may be justified even for small pumps.

Alternatives to central system

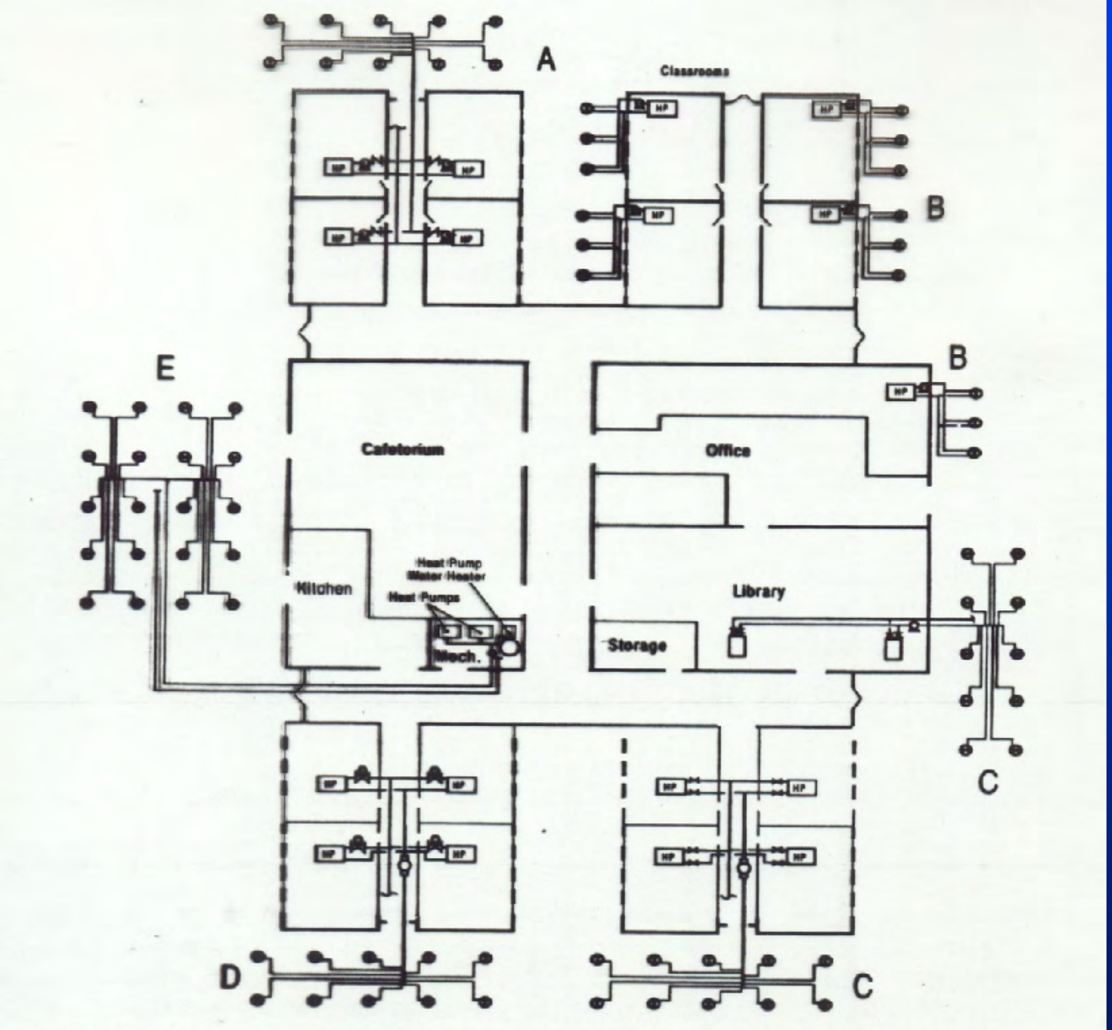


Figure 1.3 Alternatives to central loop ground-coupled heat pumps.
- **A:** One local loop, multiple heat pumps with pump and check valve on each unit
- **B:** Multiple individual loops, heat pumps, and circulator pumps
- **C:** Multiple units with one local pump that operates when one or more units is on
- **D:** Multiple units with two-way valves, one local loop, and VS pump
- **E:** Heat pumps and water heater on same loop to balance local load

Alternatives to central system

Each unit has its own pump ⇒

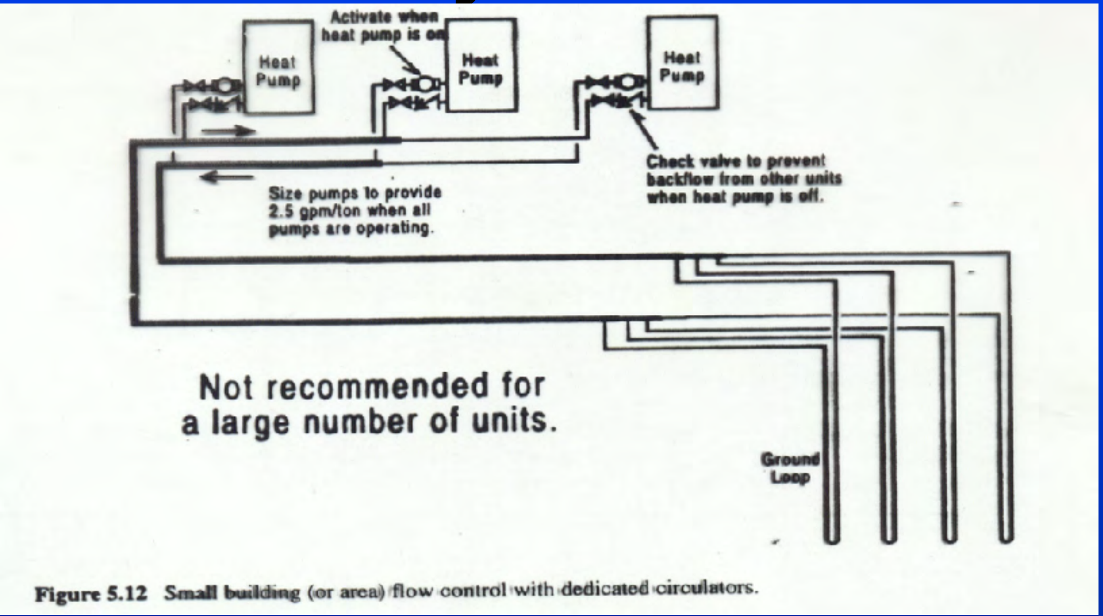


Figure 5.12 Small building (or area) flow control with dedicated circulators.

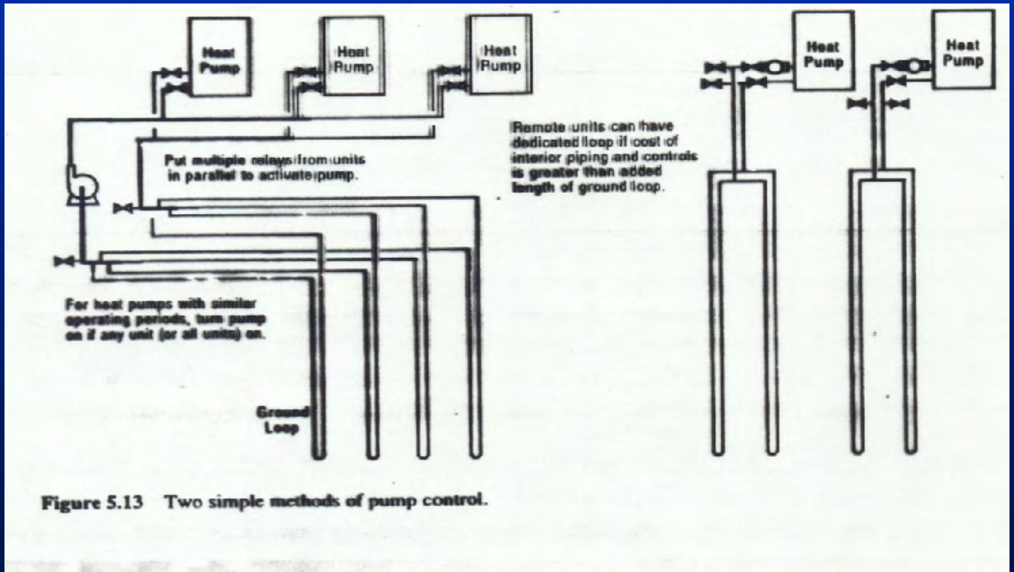


Figure 5.13 Two simple methods of pump control.

Ground-Source Heat Pumps: Design of Geothermal Systems for Commercial and Institutional Buildings

⇐ A single pump comes on if any unit is on, or each unit is totally independent.

Building Loads and Heat Pump Selection
The New Standard: ARI/ISO 13256-1

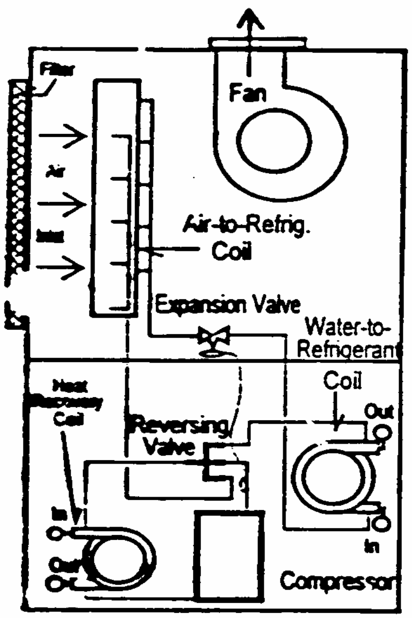
Table 1
Comparison of ARI and ISO Rating Test Conditions

RATING TESTS	Water-Loop Heat Pumps		Ground-Water Heat Pumps			Ground-Loop Heat Pumps	
	ARI/ISO	ARI 320	ARI/ISO	ARI 325 Hi	ARI 325 Lo	ARI/ISO	ARI 330
Standard Cooling:							
- air dry bulb, °F	80.6	80	80.6	80	80	80.6	80
- air wet bulb, °F	66.2	67	66.2	67	67	66.2	67
- air flow rate, Cfm	per mfr	per mfr	per mfr	per mfr	per mfr	per mfr	per mfr
- liquid full load, °F	86.0	85	59.0	70	50	77.0	77
- liquid part load, °F	86.0	75	59.0	70	50	68.0	70
- liquid flow rate, Gpm	per mfr	10°F rise	per mfr	per mfr	per mfr	per mfr	per mfr
Standard Heating:							
- air dry bulb, °F	68.0	70	68.0	70	70	68.0	70
- air wet bulb, °F	59.0	60	59.0	60	60	59.0	60
- air flow rate, Cfm	per mfr	std clg	per mfr	std clg	std clg	per mfr	std clg
- liquid full load, °F	68.0	70	50.0	70	50	32.0	32
- liquid part load, °F	68.0	75	50.0	70	50	41.0	41
- liquid flow rate, Gpm	per mfr	std clg	per mfr	per mfr	per mfr	per mfr	std clg
External Static:							
- air, in H20	0	0.1-0.3	0	0.1-0.3	0.1-0.3	0	0.1-0.3
- liquid, ft H20	0	na	0	50	50	0	17

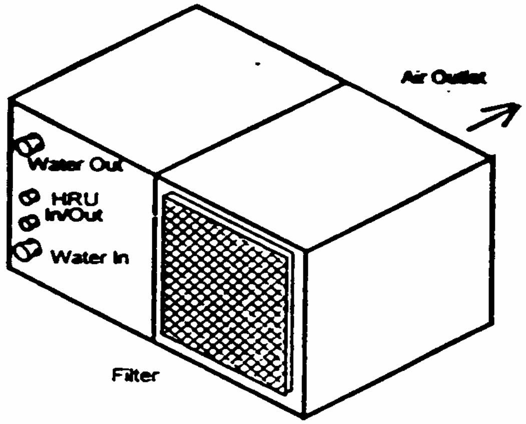
Energy Star minimum performance

System Type	Cooling EER	Heating COP
Closed Loop	14.1	3.3
Open Loop	16.2	3.6

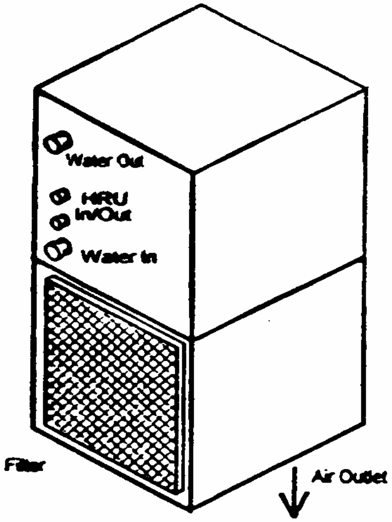
Heat Pump Unit Types



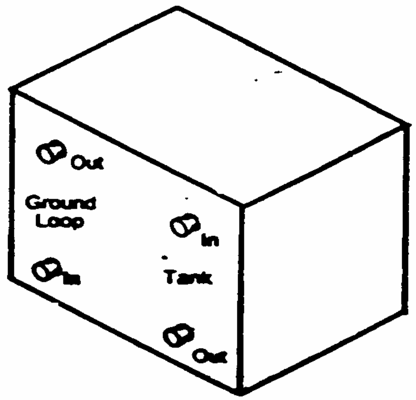
Water-to-Air Heat Pump
Vertical Upflow Package



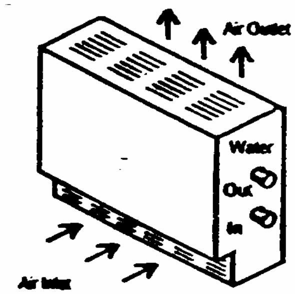
Water-to-Air - Horizontal Package



Water-to-Air Heat Pump - Counter



Water-to-Water Unit
Heat Pump, Chiller, or Water Heater



Water-to-Air Heat Pump - Console

Building Loads and Heat Pump Selection

- **Final thoughts on heat pump selection:**
  - **Recommended minimum *Energy Star* EERs/COPs**
  - **Maximum head losses in the water coil of the heat pump should not exceed 45 kPa (15 ft of water) when the flow rate is at 0.19 L/s (3 gpm) per nominal ton of cooling capacity.**
  - **Watch out for multispeed unit ratings**
  - **Use high-efficiency units:**
    - **less heat discharge in cooling mode**
    - **much better at “off-design” conditions**

Design of vertical ground-coupling

Design of the ground-coupling

- Sizing of the ground-coupling for a heat pump is different than sizing conventional equipment.
  - The capacity of the ground to absorb or provide heat is a transient heat transfer problem.
  - The thermal state of the ground is determined by prior heat addition/extractions rates and durations.
  - While significant imbalance of heat extraction/heat rejection can be tolerated, the long term impacts must be considered.
  - The ground can not be assumed infinite and the interaction of adjacent borehole heat exchangers is very important for commercial scale systems.
- Bottom line is that we need to know the load duration information as well as peak load and we need a design tool that appropriately considers all these factors as well as accuracy models the heat transfer in the ground.

Design of the ground-coupling

Equations for Loop Length

$$L_c = \frac{q_a R_{ga} + (C_{fc} \times q_{lc})(R_b + PLF_m R_{gm} + R_{gd} F_{sc})}{t_g - \frac{t_{wi} + t_{wo}}{2} - t_p}$$

$$L_h = \frac{q_a R_{ga} + (C_{fh} \times q_{lh})(R_b + PLF_m R_{gm} + R_{gd} F_{sc})}{t_g - \frac{t_{wi} + t_{wo}}{2} - t_p}$$

L_c	required bore length for heating - ft
L_h	required bore length for heating - ft
q_a	net annual average heat transfer to the ground - Btu/hr
q_{lc}	design block load for cooling - Btu/hr
q_{lh}	design block load for heating - Btu/hr
R_{ga}	effective ground thermal resistance, annual - h ft oF/Btu
R_{gm}	effective ground thermal resistance, monthly - h ft oF/Btu
R_{gd}	effective ground thermal resistance, daily - h ft oF/Btu
R_b	thermal resistance of bore - h ft oF/Btu
C_{fh}	heat pump performance correction factor, heating
C_{fc}	heat pump performance correction factor, cooling
PLF_m	part load factor, monthly pulse
F_{sc}	short-circuit heat loss factor
t_g	undisturbed ground temperature - oF
t_{wi}	heat pump fluid inlet temperature - oF
t_{wo}	heat pump fluid outlet temperature - oF
t_p	temperature penalty for adjacent bore interference - oF

Vertical Ground-Loop Design

- Design software essential for commercial- scale systems. Sources:
  - GchpCalc Version 4.1, Energy Information Services, www.geokiss.com, $300
  - GLHEPRO V.3.0, International Ground Source Heat Pump Association (IGSHPA), www.igshpa.okstate.edu, $525
  - GS2000 Version 2.0, Caneta Research Inc., www.canetaenergy.com, to be distributed free in future by NRC Canada.

Vertical Ground-Loop Design

- Oak Ridge National Laboratory has compared the results of these (and other) design programs against detailed simulation models and field data from operating systems. The results have shown that GCHPCalc is accurate and in most cases out performs the other programs. The results of the Oak Ridge studies can be found at:

  - Thornton, J. W., McDowell, T. P. and Hughes, P. J. (1997). Comparison of practical vertical ground heat exchanger sizing methods to a Fort Polk data/model benchmark. *Proceeding of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE),* 103(2), ASHRAE, Atlanta, GA.

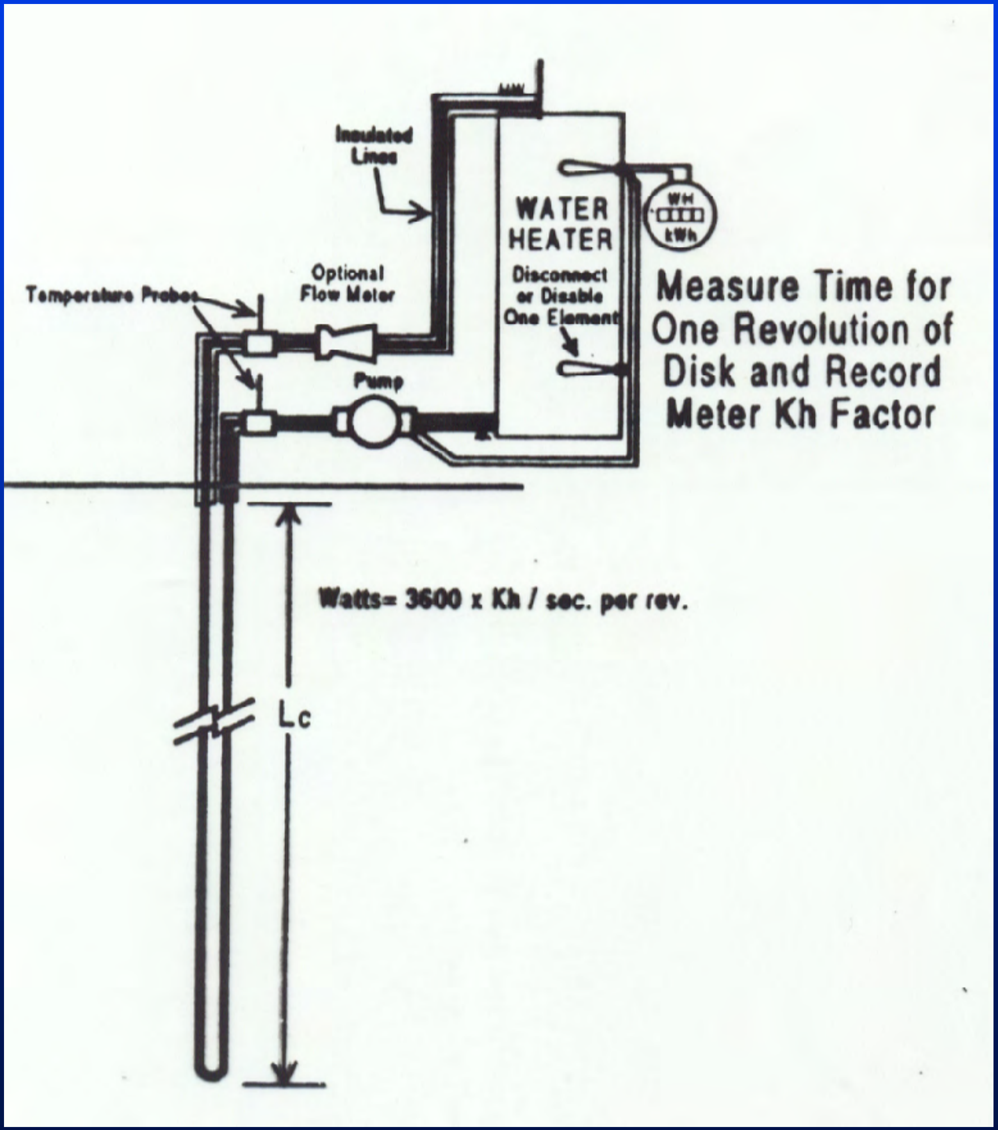
  - Shonder, J. A., Baxter, V., Thornton, J., and Hughes, P.. (1999a). "A New comparison of vertical ground heat exchanger sizing methods for residential applications." Proceeding of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), 105(2), ASHRAE, Atlanta, GA.

  - Shonder, J. A., Baxter, V., Hughes, P., and Thornton, J. (2000a). "A comparison of vertical ground heat exchanger design software for commercial applications." *Proceeding of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers* (ASHRAE), 106(1), ASHRAE, Atlanta, GA.

Other Ground-Loop Considerations –Thermal tests

- Through site characterization, including test boring is advisable, especially where little is known about the geological conditions ***at the job site***.
- For larger projects, say 100 tons or more, in-situ thermal properties tests will probably be justified.
- Recommendations for thermal properties testing requirements and methods can be Found in Chapter 32 of the 2003 ASHRAE HVAC Applications Handbook.

Other Ground-Loop Considerations –Thermal tests



Other Ground-Loop Considerations - Antifreeze

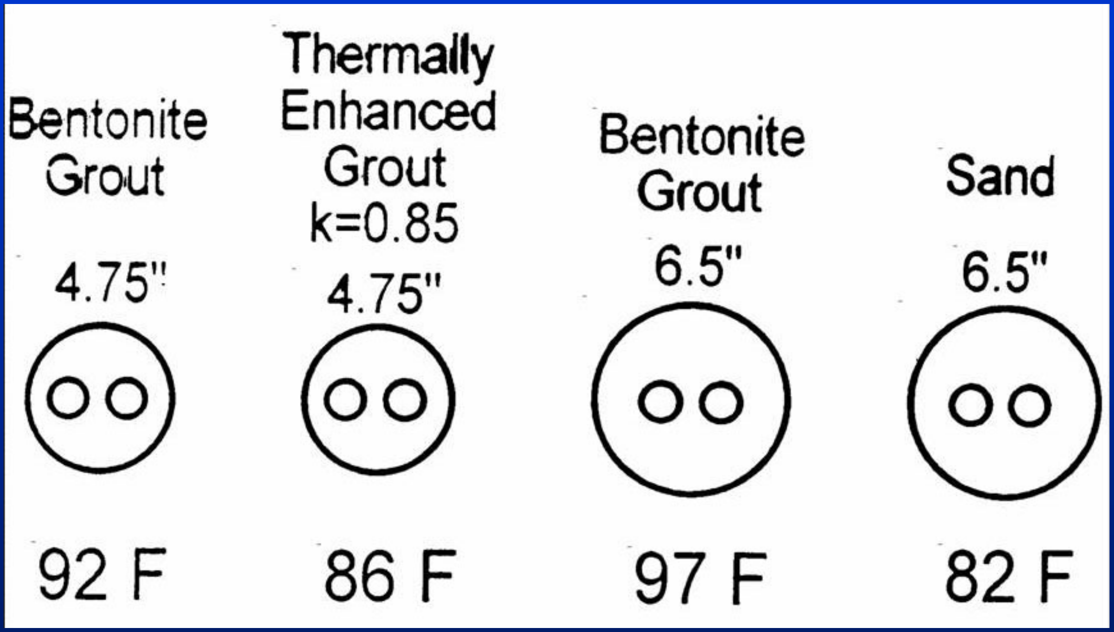
- Antifreeze is seldom necessary in vertical ground-coupled systems.
- When it is necessary, use the minimum amount for protection.
- A number of antifreeze compounds are available, each with desirable and undesirable properties. Propylene glycol is often the best all around choice, consult Chapter 32 of the 2003 ASHRAE HVAC Applications Handbook for a discussion of the various antifreeze compounds used and their individual attributes.

Other Ground-Loop Considerations -Grout

- Grout is often required by the regulatory authorities to protect ground water from surface contamination, or prevent cross contamination of aquifers.
- Unfortunately the thermal conductivity of the popular bentonite based grouts is very low when compared to most geologic formations.
- Hence, grouting of the borehole with conventional bentonite grout is analogous to insulating your heat exchanger.
- Thermally enhanced grouts have been developed to address this issue.

Other Ground-Loop Considerations -Grout

A set of tests conducted by Spilker (1998) showed the dramatic effects that grout can have on the average circulating water temperature after just 48 hours of continuous heat rejection:



Details of the tests can be found at : Spilker, E. H. (1998). "Ground-coupled heat pump loop design using thermal conductivity testing and the effect of different backfill materials on vertical bore length." *Proceedings of the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)*, Atlanta, Georgia.

Other Ground-Loop Considerations -Grout

The Three Rules of Grouting:

- I. Reduce borehole to minimum size necessary to reduce grout volume and preserve the geological formation.
- II. Grout only that portion of borehole required by regulation (use clean sand in remainder if allowed).
- III. If significant portions of the borehole (say more than 25%) will be grouted, use thermally enhanced grout, especially if the formation has high thermal conductivity.

Other Ground-Loop Considerations – regulatory requirements

- Regulatory requirements vary widely by state.
- Studies have been completed of the various state requirement’s, however they continue to evolve so check with the state and/or other local authorities before proceeding with design.

Piping and Pumps

Piping and Pumps

- General recommendations:
  - Size piping based on accepted design guides (references given at end of presentation)
  - Avoid use of antifreeze, use low concentration
  - Variable-speed pumping w/ two-way valves on HPs
  - Use high-efficiency motor and operate pump near its sweet spot
  - Select heat pumps and valves with low ΔP
  - Pump no more water than necessary, 2.5 to 3 gpm per ton of peak block load for vertical ground-coupled systems.

Ventilation Air

- Various solutions are available depending on climate and type of installation:
  – For classrooms and hotel-type installations in moderate climates, console units may be best
  – For larger units, preconditioned air can be ducted to each unit
  – Sensible heat recovery is probably worthwhile in heating-dominated climates
  – Water source heat pumps normally have high latent capacity, but preconditioning may still be advisable in humid climates

Cost Control

- Some possible cost control measures:
  – Use hybrid systems in cooling dominated climates
  – Avoid costly sophisticated control systems, GSHPs inherently provide excellent zone control
  – Use accepted design guides and consult experienced designers
  – Encourage bids from contractors outside local area if inadequate local infrastructure exists

Disclaimers and warnings

- **I can't cover all the details in a one hour presentation so if you plan to design a GSHP systems here are some steps that will help you successfully do so:**
  - **Take a short-course on design of these systems, sources I can recommend are:**
    - **ASHRAE Short courses (not comprehensive, a starting point only, offered intermittently at ASHRAE meetings)**
    - **University of Wisconsin (next offered on 12-14 September 2005)**
    - **GchpCalc courses (offered occasionally via Energy Information Services)**
  - **Obtain a copy of one of the recommended design software programs and training on how to use it. Do not size ground-coupling based on rules-of-thumb, manufacturers recommendations, etc.**
  - **Obtain copies of the accepted design guides *and use them*, see list at end of presentation. If you have questions consult an experienced designer.**
  - **Do not make the systems overly complicated by adding unnecessary backup, redundancy, controls, etc.**

References

- **Recommended design references:**
  - ***2003 ASHRAE Handbook, HVAC applications*. Chapter 32 – Geothermal Energy. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Atlanta, GA.**
  - **ASHRAE. (1997). *Ground source heat pumps—design of geothermal systems for commercial and institutional buildings*. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE), Atlanta, GA.**
- **Recommended survey article:**
  - **Phetteplace, Gary (2002) Ground-source heat pumps. In: *Renewable energy: trends and prospects*. (S.K. Majumdar, E.W. Miller, and A.I. Panah, Eds.). Pennsylvania Academy of Science, Chapter 14, p. 231-244. ISBN 0-945809-17-4**

Packaged Central Plants

August 4, 2005

TRANE

Success Has Partners

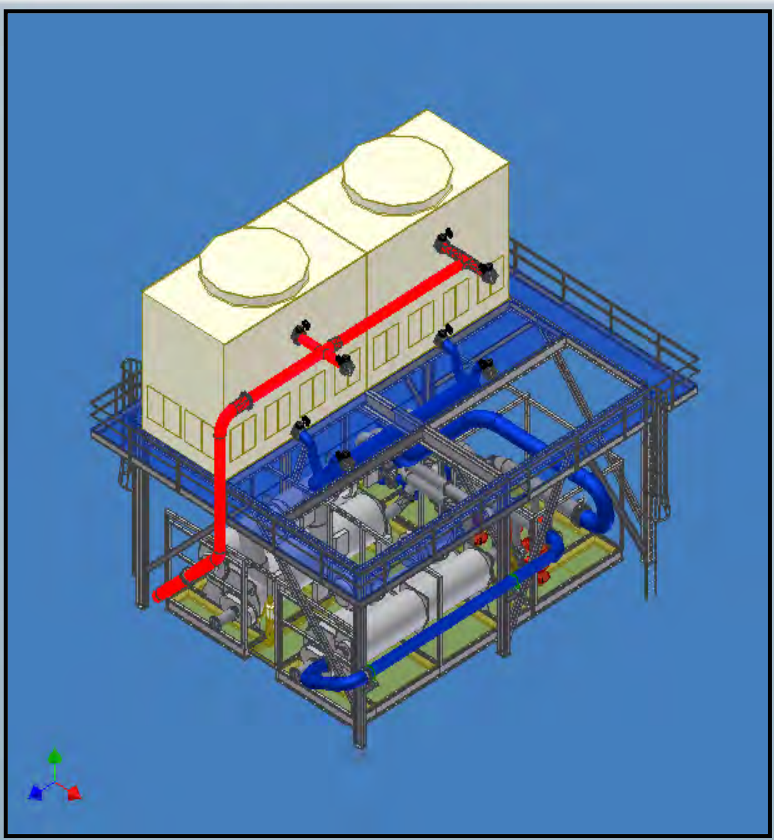
ISO 9001:2000

Agenda

- ✓ Packaged Central Plant Product
- ✓ Capabilities/Value Proposition
- ✓ Application
- ✓ Summary

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Packaged Plant Product



- Engineered Package:
  - **Single or Multiple Chillers**
  - **Boilers and/or Plate & Frame HX**
  - **Chilled water pumps (N+1)**
  - **Condenser water pumps (N+1)**
  - **Hot Water Pumps (N+1)**
  - **Motor Control Centers**
  - **Controls: DDC or PLC**
  - **Fully Air Conditioned Enclosure**
    - **Optional "Convertible" versions**
  - **Cooling Tower**
  - **Tower support structure and piping**
- Guarantees:
  - **Cost ($/ton)**
  - **System Efficiency (kW/ton)**
  - **Completion date (months)**

Benefit of Packaging: Contract to Require Performance Liquidated Damages (LD's) for Efficiency, Tons, etc.

Quantitative Advantages

- ✓ <u>Cost</u> – Typical installed cost savings of $200-$300 per ton versus field-erected systems
- ✓ <u>Schedule</u> - can save up to 50% (6 months) versus typical design/bid/construct
- ✓ Industrial Quality
  - ✓ ISO 9001:2000 Manufacturing Processes
  - ✓ B31.1 Piping
- ✓ High System Efficiency
  - ✓ Chiller/Pump/Tower Optimization
- ✓ Equipment Enclosure
  - ✓ Realize use of building space once reserved for mechanical room(s)
- ✓ Compact Footprint
- ✓ Standardized O&M service and parts

Innovation → Efficiency → Savings = Guaranteed ^ Best Value

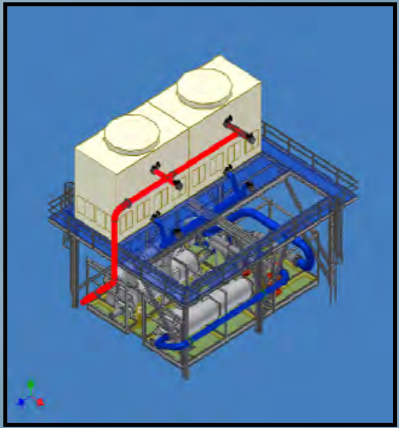
Qualitative Advantages

- ✓ **Single-source responsibility**
  - ✓ **Integration**
  - ✓ **One set of submittal, P&ID, PFD documents**
- ✓ **Simplified project execution**
- ✓ **Flexible - customizable to fit specific site conditions**
  - ✓ **Various scope options: compatible with TES, BCHP, and Cogeneration**
- ✓ **Portability**
  - ✓ **On-site as processes/needs change**
  - ✓ **Different sites**
- ✓ **Guaranteed and predictable performance**

Innovation → Efficiency → Savings = ^ Best Value
Guaranteed

Plant Maintenance and Serviceability

- ✓ **Dry room for switchgear and controls**
- ✓ **Minimum 5 foot aisle between chillers**
- ✓ **Clearance for compressor removal**
- ✓ **Overhead monorail hoist (pumps)**
- ✓ **Removable end-walls or doors for tube access**
- ✓ **Internal catwalks and ladders**
- ✓ **Cooling tower catwalk & railing**



Innovation → Efficiency → Savings = ^ Best Value Guaranteed

TAS PACKAGED CENTRAL PLANTS

TRANE

Project: 2000 Ton Central Plant
TAS Proposal Number: 2004-I
Customer Name Medical Building

Option 1: Field Erected 2000 ton plant

Option 2: TAS H-Series with 2 x Long barrel simplex chillers

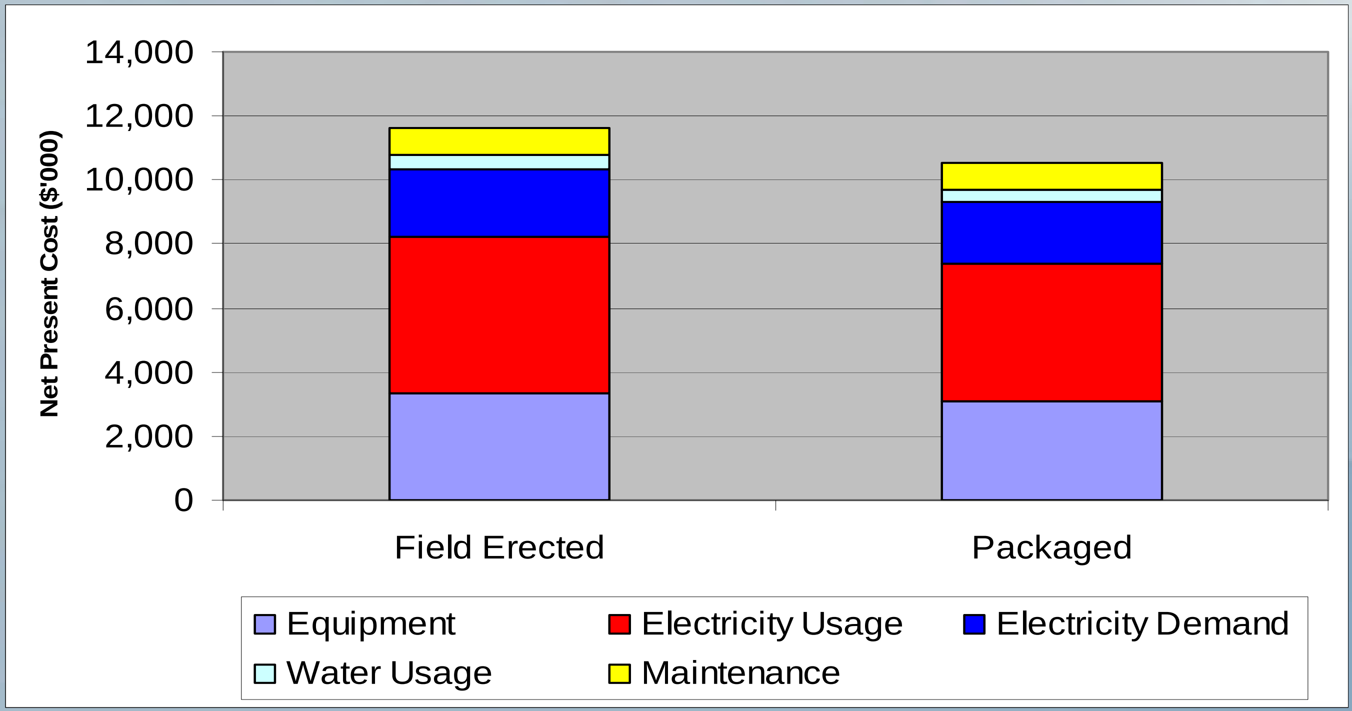
Input:		
Total Installed Tons:	2000	
Planned Full Load:	100%	*Use if redundancy exists*
Running Full Load Tons:	2000	

	Option 1 (MC Estimate)		Option 2 - TAS PCP (actual)
Concrete Slab:	0		26,250
Chillers:	400,000		2,350,000
Cooling Towers:	170,000		included
Cooling Tower Structure:	48,000		included
Pumps:	96,000		included
Piping/Valves/Instrumentation:	370,000		included
Insulation:	148,000		included
Controls:	88,000		included
Chiller Plant Building:	320,000		included
Startup:	37,200		included
Commissioning:	64,000		included
Electrical:	344,000		included
Shipping:	74,000		90,000
Rigging:	56,000		45,000
Water Treatment:	35,000		35,000
Building HVAC:	48,000		included
Refrigerant Monitoring System:	30,000		included
Field Labor:	170,000		130,000
Warranty:	70,000		included
Subcontractor Mark-up	337,230		31,500
General Contractor Mark-up	435,815		406,163
Construction First Cost:	**3,341,245**	Actual	**3,113,913**
($/ton)	*1,671*		*1,557*
Performance Input:	**(ESTIMATED)**		**(ACTUAL)**
kW/Ton:	0.85		0.75
Running Load kW:	1,700		1,500
Connect Load kW:	1,700		1,500
Full Load Hours/Year:	4,117		4,117

Innovation → Efficiency → Savings = ^ Best Value *Guaranteed*

TAS™

Net Present Cost Comparison



Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Packaged Plant Product Benefits

Benefit	Packaged	Conventional
Energy Efficiency (kW/ton)	.70-.80	.85-1.0+
Eliminates Need for Building	Yes	No
Installed Capital Cost ($/ton)	950-1500	1600-2200+
Deployment Schedule (mos.)	6-9	18-24
Compactness	Yes	No
Portability	Yes	No
Modular Concept	Yes	No
Constructability	Simple	Complex

Innovation → Efficiency → Savings = Guaranteed ^ Best Value

TAS™

Packaged Central Plant Interior

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Integrated Switchgear

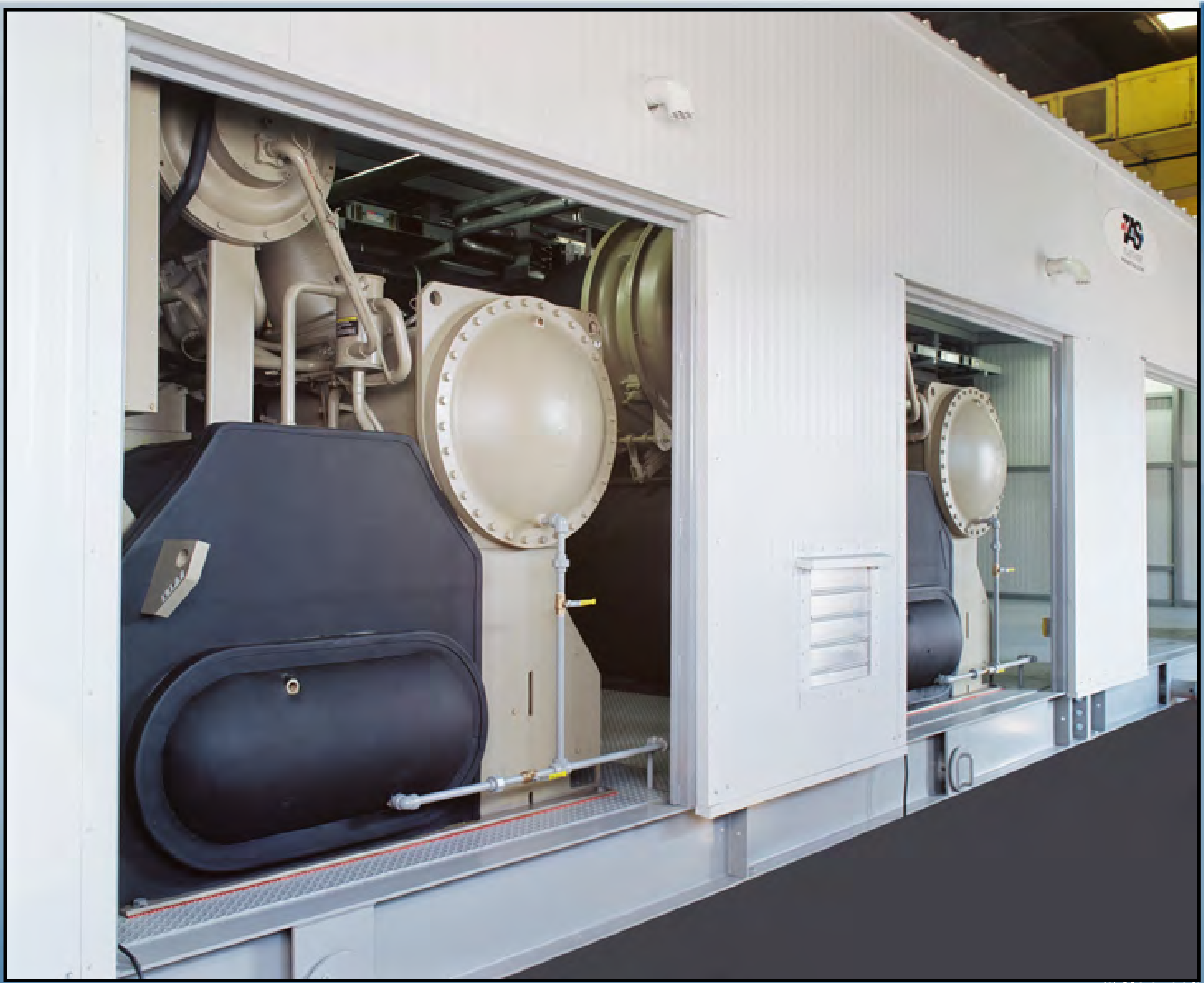
Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Electrical/Control Dry Room separate from Chillers and Pumps

Pumps and Headers

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Accessibility



Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Typical Package Installation

Installation Statistics:

- 7-Man Crew
- 4 x 10 hour Days
- 4 Days per week

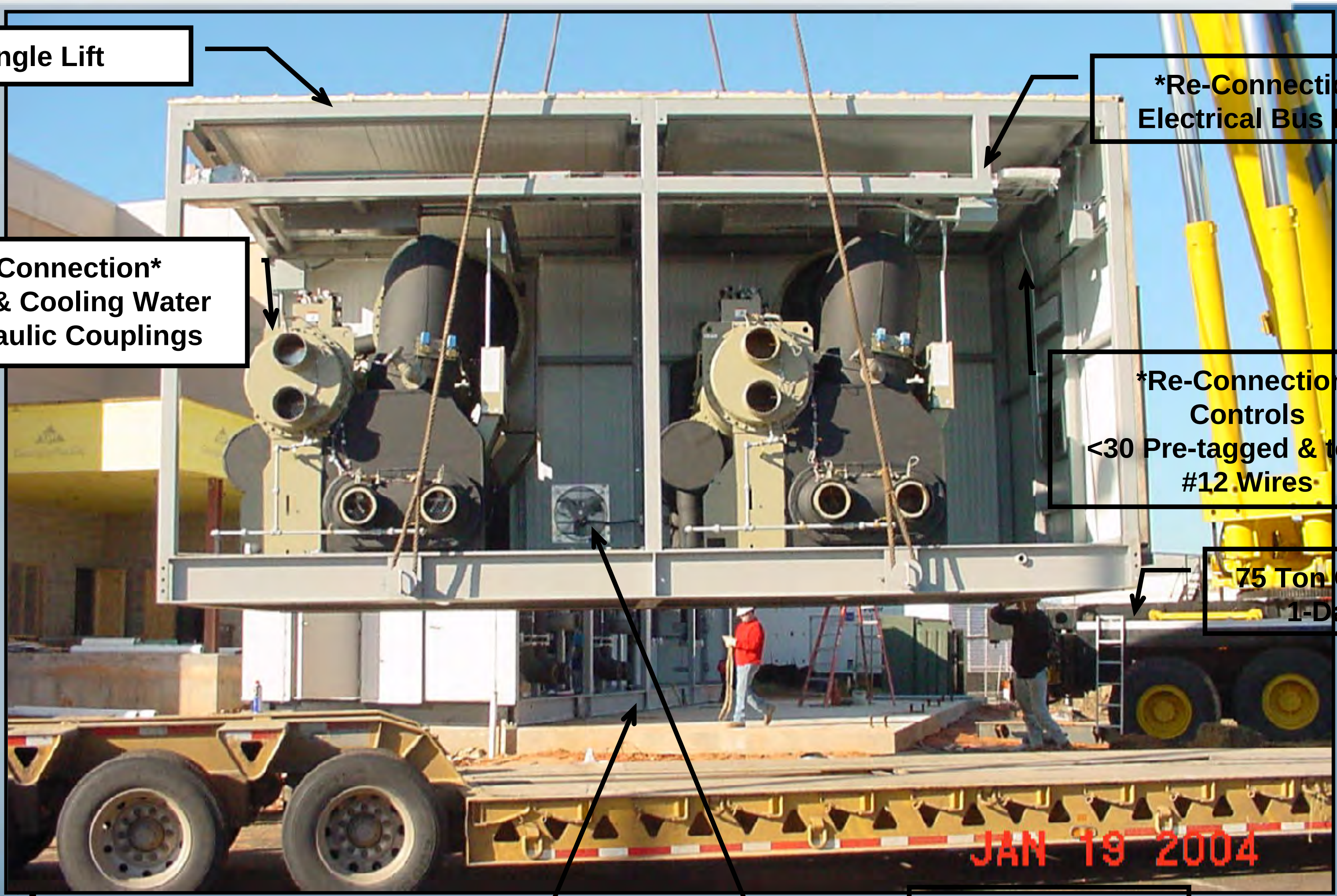
Plant Installed in 16 Working Days

Project Information:

- 1,200 tons Installed Now (2 x 600TR Centrifugal Chillers)
- Additional Expansion Planned (2 x Centrifugal Chillers)
- Expansion to be inside shown package and will require less than 10 days to install and require zero plant outage

Guaranteed
Innovation → Efficiency → Savings = ^ Best Value

Receipt, Unloading, and Setting of Modules



Day 1

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

TAS

Internal Package & Cooling Tower Structure Major Assembly Complete

Lt Weight Hoist Truck
10 Days

Guaranteed
Innovation → Efficiency → Savings = ^ Best Value

Cooling Tower scheduled for Just-in-Time Delivery and Placement

20 Ton Crane
(1 Day)

Innovation → Efficiency → Savings = ^ Best Value *Guaranteed*

1200 Ton Facility Installed
Bossier City, Louisiana

29 calendar days to install

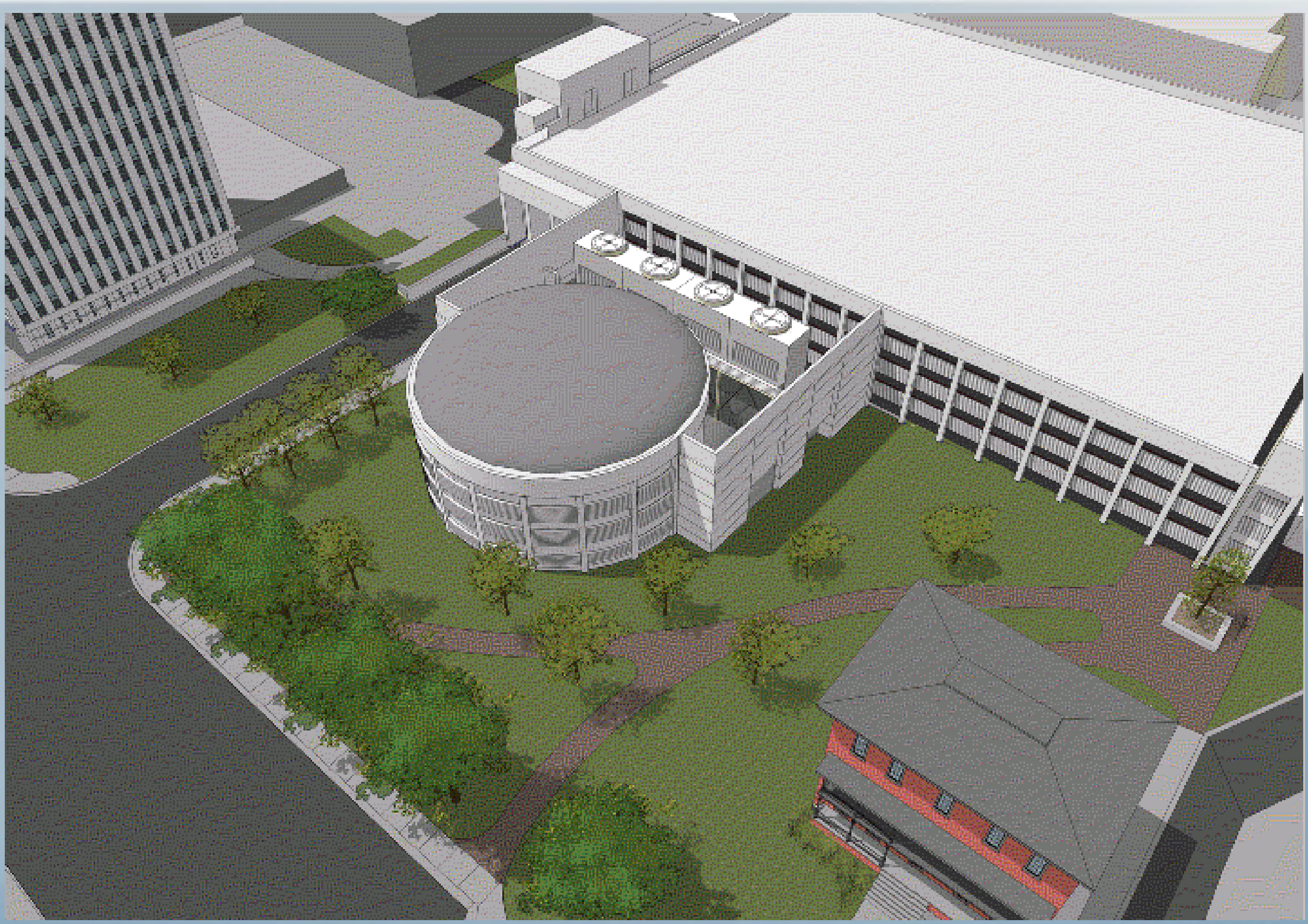
24 weeks from order to chilled water

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

1200 Tons – Rincon, California

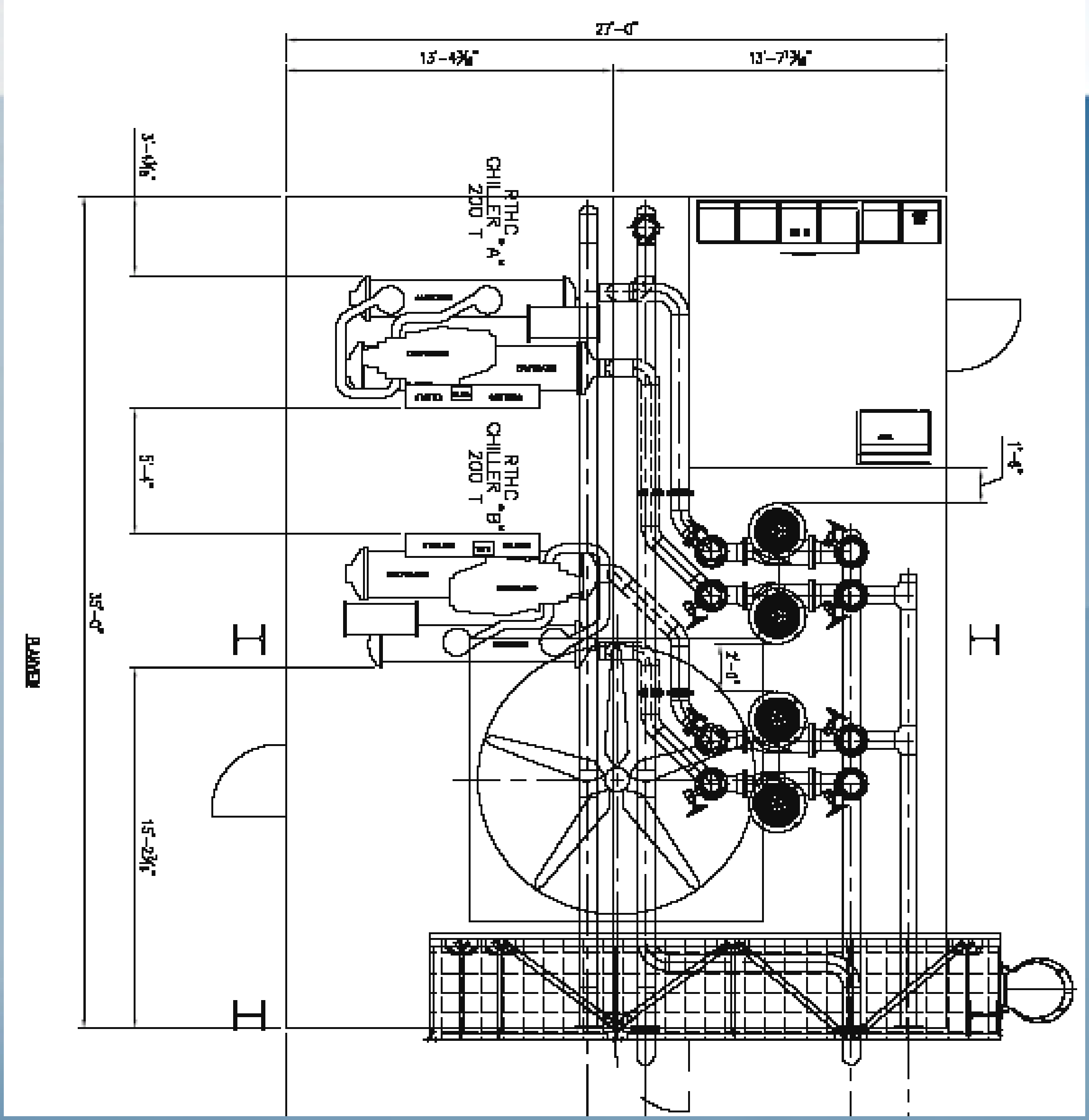
Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Screening Options



400 Tons - Stafford, Texas

- Water-Cooled Screw Compressor Chillers
- Replaced Air-Cooled Chiller system
- Delivery to Startup: 9 Days



Innovation → Efficiency → Savings = ^ Best Value
Guaranteed

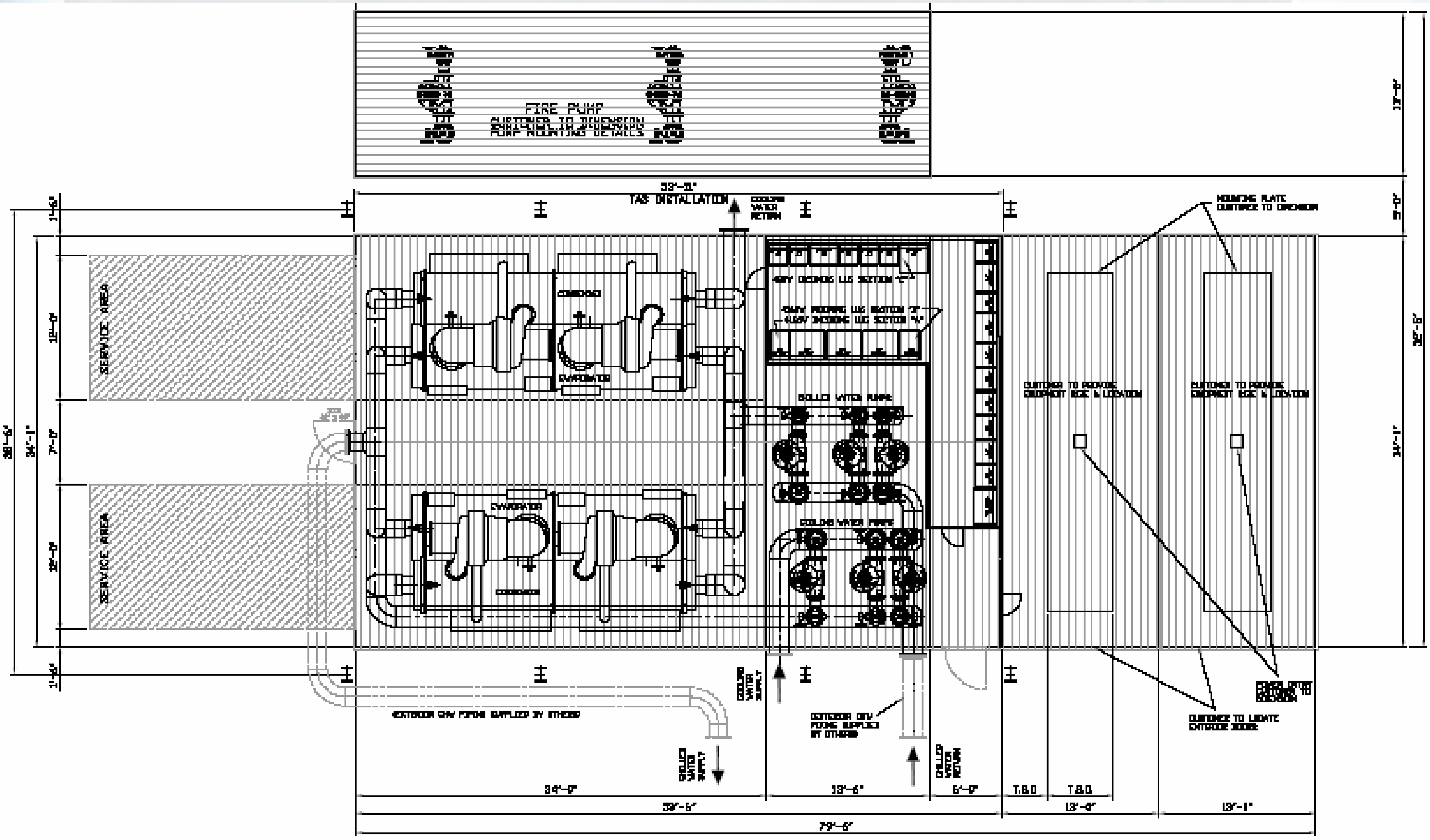
400 Ton Packaged Plant

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

400 Ton Packaged Plant

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

5000 Ton Packaged Plant – Pompano, Florida



5000 Ton Packaged Plant – Pompano, Florida

Innovation → Efficiency → Savings = ^ Best Value *Guaranteed*

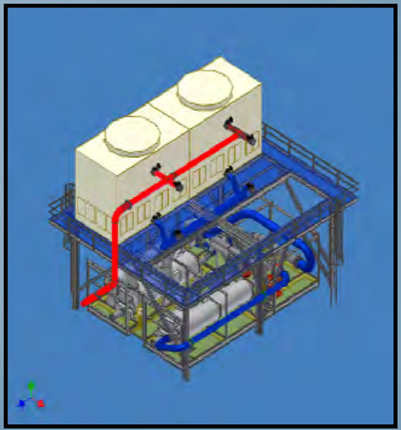
5000 Ton Packaged Plant – Pompano, Florida

Innovation → Efficiency → Savings = ^ Best Value *Guaranteed*

TAS™

Summary

- ✓ Reduced first cost
- ✓ High-efficiency plant
  - ✓ Lowest Life-cycle cost
- ✓ Reliability
- ✓ Quality
- ✓ Reduced footprint
- ✓ Minimal site interference = Maximum Safety
- ✓ Shortened construction cycle
- ✓ Guaranteed performance



Innovation → Efficiency → Savings = ^ Best Value *Guaranteed*

Additional Information

Trey Austin

TAS Packaged Central Plants
4300 Dixie Drive
Houston, Texas 77021
Tel: 713-877-8700
E-mail: taustin@tas.com
Website: www.tas.com

USACE Engineering and Construction Bulletin #2004-16

Innovation → Efficiency → Savings = ^ Best Value Guaranteed

Electrical Military Workshop

Infrastructure Systems Conference

August 05

Electrical- Military Workshop

Professional Development Hours

Monday Through Thursday

19 PDHs

Electrical - Military Workshop

Today (Wednesday)

8:00-9:30	Tri-Service Criteria Overview
10:30-12:00	Lighting Criteria Information Technology Criteria
2:00-3:30	Mass Notification System Electronic Card Access Locks
4:00-5:30	Lightning Protection

Electrical - Military Workshop

Thursday

8:00-9:30	Electronic Security
	Airfield Lightning Protection, Grounding & Lighting
10:30-12:00	Electrical Safety and Arc Flash
	Electrical Infrastructure in Iraq

Electrical - Military Workshop

Thursday

Training Session

1:00-5:00 2005 NEC Code Changes

Tri - Service Electrical Criteria

Infrastructure Systems Conference

August 05

Tri-Service Electrical Criteria

- Origin of Tri-Service Criteria Mandate
- Introduction of Electrical Working Group
- Review of UFC and UFGS Initiatives
- Whole Building Design Guide
- Non-Government Standards Contract
- Questions

DOD Unified Facilities Criteria

- Implemented by 29 May 2002 letter from USD E.C. Aldridge

- MIL-STD-3007B, 1 April 2002, Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications

Tri-Service Electrical Working Group

- **Corps of Engineers**
  - Bob Billmyre
  - Bob Fite
- **Navy**
  - John Peltz
  - Richard Cofer
- **Air Force**
  - Larry Strother
  - Daryl Hammond

Unified Facilities Criteria (UFC)

- Design Criteria to replace TMs, AFMANs, MIL-HDBKs, etc.
- Updates - true Tri-Service documents
- Some existing Documents have been renumbered
- See UFCs on WBDG (http://65.204.17.188/report/doc_ufc.html)

UFC - Progress Overview

Series 3-500 Elect *	5 / 03	7 / 05	200X
Total Scheduled	57	42	22
- Unified	45	23	22
- Air Force Only	5	2	0
- Army Only	4	5	0
- Navy Only	3	12	0
Total Published	2	14	22
- Unified	2	5	22
- Air Force Only	0	0	0
- Army Only	0	3	0
- Navy Only	0	6	0

* (5/03 incl 2 in 4-020 Sec 7/05 incl 7 in 4-0xx Sec)

UFC - Progress Overview (Cont'd)

Series 3-500 Elect	5 / 03	7 / 05	200X
Total In Progress	17	17	0
- Unified	5	14	0
- Air Force Only	5	0	0
- Army Only	4	1	0
- Navy Only	3	2	0
Total In Planning	38	11	0

Unified Facilities Criteria (UFC)

Published, Tri-Service:

3-510-01	Foreign Voltages
3-520-01	Interior Electrical Systems
3-570-06	Cathodic Protection O&M
3-580-10	NMCI Std Constr Practices
4-021-01	Mass Notification Systems

Unified Facilities Criteria (UFC)

Published, Not Tri-Service:

3-501-03 N	Elect Eng Prelim Des Consid
3-540-04 N	Diesel Elect Gen Plants
3-550-03	Exterior Elect Distrib - 2 vers.
3-560-10 N	Electrical Safety
3-570-02	Cathodic Prot Des- 2 vers.
4-020-04 FA	Electronic Security Systems
4-021-02N	Electronic Security Systems

Unified Facilities Criteria (UFC)

Completed, in approval process:

3-530-01	Lighting
3-535-01	Airfield Lighting (Vol I)
3-580-01	Telecom, Inside Plant

Unified Facilities Criteria (UFC)

Final Draft in Review:

3-500-10N	Elect Design (incl design-build)
3-500-05	RF Shielded Enclosures
3-560-01	Electrical Safety
3-575-01	Lightning Protection
4-021-02N	Electronic Security Systems

Unified Facilities Criteria (UFC)

In Progress:

3-500-04	Battery Rooms
3-500-10	Electrical Design
3-535-02	Airfield Lighting, (Vol II)
3-550-01	Exterior Electrical Distribution
3-570-07	Cathodic Protection Design
3-580-02	Telecom, Outside Plant
4-021-XX	Electronic Security PV
4-021-XX	Electronic Security Testing
4-021-02 A	Electronic Security System

Simple Concept

- Existing: UFGS 16xxxN
  UFGS 16xxxA
- Updated to: UFGS 16xxx
- Master Format – upcoming
- Current Listings on WBDG

  http://www.wbdg.org/design/ufg_specs.php

Master Format Overview

- Current #'s per 1995 Const Specs Institutes (CSI)
- CSI rev and exp #'s in 2004, see (http://www.csinet.org/s_csi/docs/9400/9361.pdf).
- Previous 16 Divs exp to 49 Divs for rapid dev areas
- Div 13 Sec - to Div 28
- Div 16 Pwr – Most to Div 26, Some to 33
- Div 16 Telcom & Spec Syst – Most Div 27, Some 33
- Div 16 Fiber and VFDs - to Div 40

Unified Facilities Guide Specs (UFGS)

Master Format Overview (Cont'd)

- Navy, Army, Air Force and NASA to MasterFormat 2004
- UFGS sect #'s use new syst to level 4 (XX XX XX.XX)
- Additional level 5 planned to replace the "A" and "N"
    - Instead of "A" use XX XX XX.XX 10
    - Instead of "N" use XX XX XX.XX 20
- Other agencies (NASA, VA, EPA, GSA) joining UFGS would carry extensions (30, 40, 50, etc)
- Goal - Revised # ' s early as Oct 2005

UFGS - Progress Overview

	2003	2005	200X
Div 13 Spec Syst			
- Total	20	21	14
- Unified	2	5	14
- Army Only	9	7	0
- Navy Only	9	9	0
Div 16 Electrical			
- Total	77	64	49
- Unified	2	19	39
- Army Only	36	29	0 (10cw)
- Navy Only	39	16	0

Unified Facilities Guide Specs (UFGS)

Highlights

- 16050N, Basic Elect Materials & Methods – will be eliminated and content incorp in individual specs
- 16081, Apparatus Inspection & Testing - adopted by all services

Unified Facilities Guide Specs (UFGS)

Interior Electrical

- 16402 incorp / replaced 16415A & 16402N
- Separate lighting specs & plates –
  - Interior 16510 & Exterior 16520
- Separate sw board & sw gear spec - 16442
- Separate VFD spec16261 - in progress
- Unified UPS spec 16262 – in progress

Unified Facilities Guide Specs (UFGS)

Exterior Electrical

- UG - 16302 in progress incorp 16375A
- Aerial – 16301 in progress incorp 16370A

With separate supporting specs for:

- 3 ph transformers 16272
- 1 ph transformers 16273
- SF6 padmount switchgear 16341N
- Secondary unit substations 16360
- Primary unit substations 16361N

Unified Facilities Guide Specs (UFGS)

Engine Generators

- Upcoming - Merge 16237N with 16263A & 16264A to create one or two UFGS
- 16230N, 16231N, 16232N, 16233N, 16234N have been eliminated
- 16236N MG sets used by waiver only

Unified Facilities Guide Specs (UFGS)

Electronic Systems

- Electronic Security - Merge 13720A & 13721A with 13702N & 13703N (in final new draft)
- CCTV – new 16751 in progress
- Telecom – Interior 16710 & Exterior 16711 replaced previous Army and Navy versions

Miscellaneous Merges

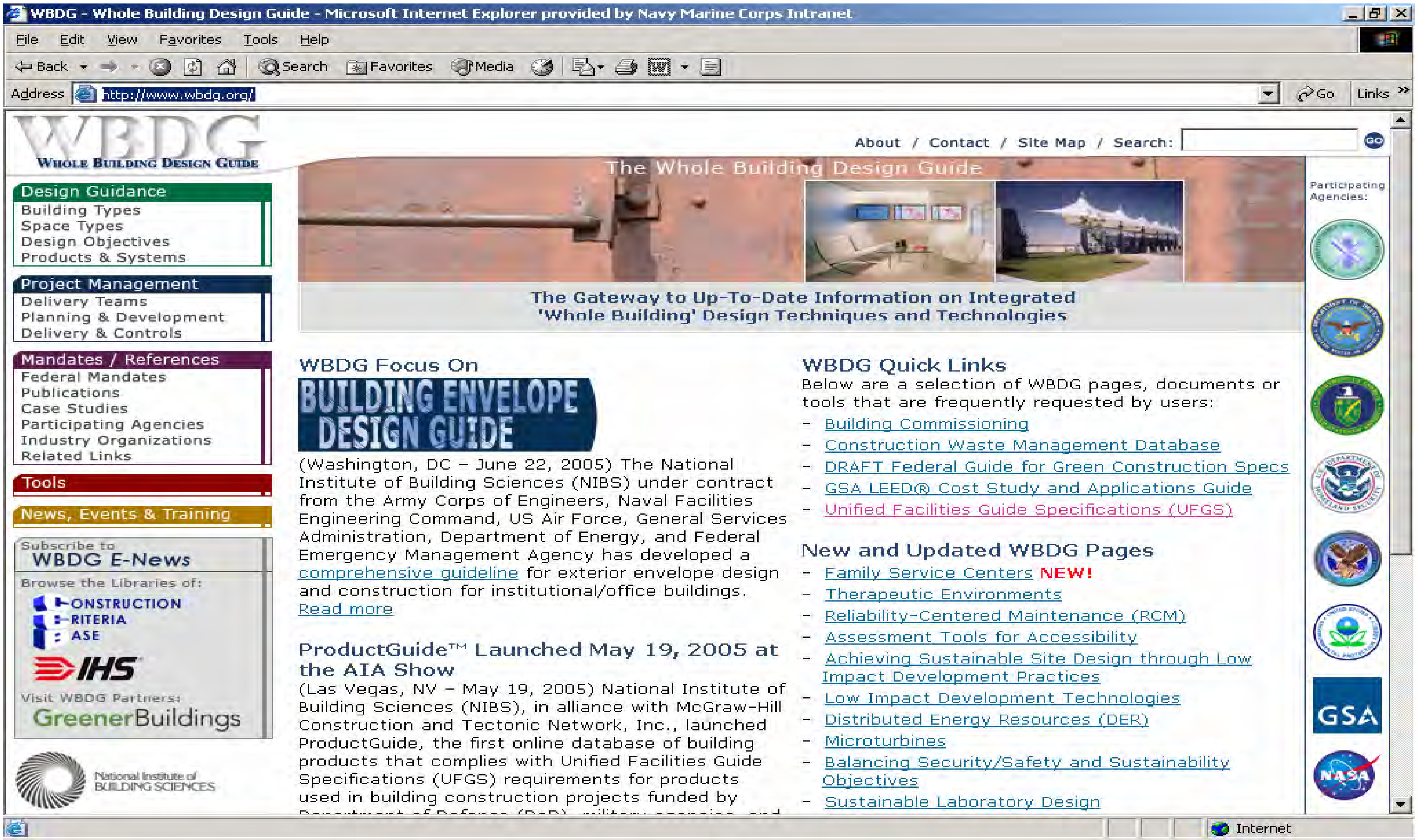
- Airfields - 16522N, 16525A, 16526 A - Planned
- LP- 13100N & 13100A - Final draft in prog
- Cath Prot - 13110-12N, 13110-12A - Planned
- ATS - 16410N, 16410A - In progress
- Intercom - 16721A, 16822N - Final draft in rev
- Shielding - 13092N, 13090A - Planned

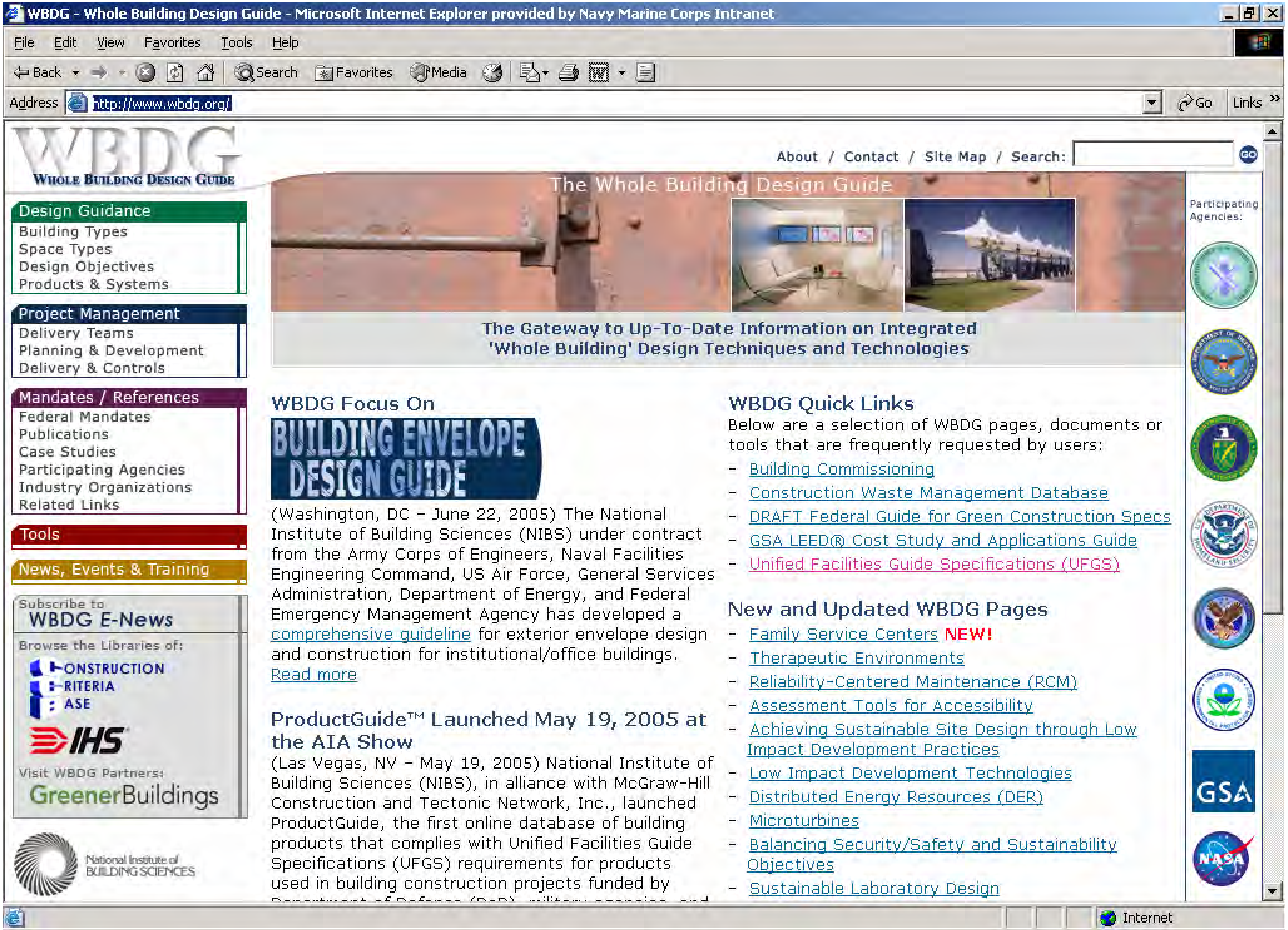
Tri-Service Electrical Criteria

Whole Building Design Guide
"htttp://www.wbdg.org/"

- Links to UFC, UFGS, and Non-Government Standards Contract (IHS)
- IHS has most standards referenced in UFGS and UFCs
- Link to IHS via Army: "http://www.wbdg.org/pdfs/army_ihs_brochure.pdf"
- Link to IHS via Navy: "https://login.ihserc.com/cgi-bin/ihslogin?"

Whole Building Des Guide (wbdg.org)

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BUILDING ENVELOPE DESIGN GUIDE
(Washington, DC – June 22, 2005) The National Institute of Building Sciences (NIBS) under contract from the Army Corps of Engineers, Naval Facilities Engineering Command, US Air Force, General Services Administration, Department of Energy, and Federal Emergency Management Agency has developed a comprehensive guideline for exterior envelope design and construction for institutional/office buildings. Read more
ProductGuide™ Launched May 19, 2005 at the AIA Show
(Las Vegas, NV – May 19, 2005) National Institute of Building Sciences (NIBS), in alliance with McGraw-Hill Construction and Tectonic Network, Inc., launched ProductGuide, the first online database of building products that complies with Unified Facilities Guide Specifications (UFGS) requirements for products used in building construction projects funded by
WBDG Quick Links
Below are a selection of WBDG pages, documents or tools that are frequently requested by users:
- Building Commissioning
- Construction Waste Management Database
- DRAFT Federal Guide for Green Construction Specs
- GSA LEED® Cost Study and Applications Guide
- Unified Facilities Guide Specifications (UFGS)
New and Updated WBDG Pages
- Family Service Centers NEW!
- Therapeutic Environments
- Reliability-Centered Maintenance (RCM)
- Assessment Tools for Accessibility
- Achieving Sustainable Site Design through Low Impact Development Practices
- Low Impact Development Technologies
- Distributed Energy Resources (DER)
- Microturbines
- Balancing Security/Safety and Sustainability Objectives
- Sustainable Laboratory Design
Participating Agencies:
GSA
NASA
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Department of Defense (DOD)

Participating Agencies Index > Department of Defense

Unified Facilities Criteria Program

Unified Facilities Guide Specifications (UFGS)
Unified Facilities Criteria (UFC) Technical Publications
Criteria Change Request (CCR)
Unified Facilities Space Program Spreadsheets

The Department of Defense (DoD) and the military services have initiated a program to unify all technical criteria and standards pertaining to planning, design, construction, and operation and maintenance of real property facilities. The objective of the Unified Facilities Criteria (UFC) program is to streamline the military criteria system by eliminating duplication of information, increasing reliance on private-sector standards, and creating a more efficient criteria development and publishing process. Both technical publications and guide specifications are part of the UFC program. Previously, each service had its own publishing system resulting in criteria being disseminated in different formats. UFC documents have a uniform format and are identified by a number such as UFC 1-300-1.

Though unification of all DOD criteria is the ultimate goal, there are instances when a particular document may not apply to all services, or some documents may have not been fully revised to reflect all service requirements before being issued in the UFC system. In these instances, the UFC or UFGS document number will be followed by an alpha-designator, such as UFC 1-300-09N or UFGS 01320A. Alpha-designators are as follows:

A USACE

US Army Corps of Engineers®

IHS Technical Solutions

NAVFAC

Non-Government Standards-IHS

IHS Technical Solutions

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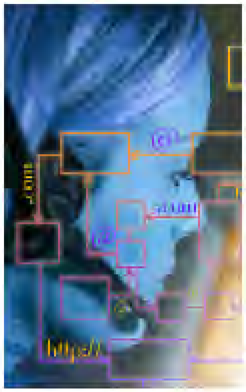
http://www.wbdg.org/pdfs/army_ihs_brochure.pdf



Customer Support

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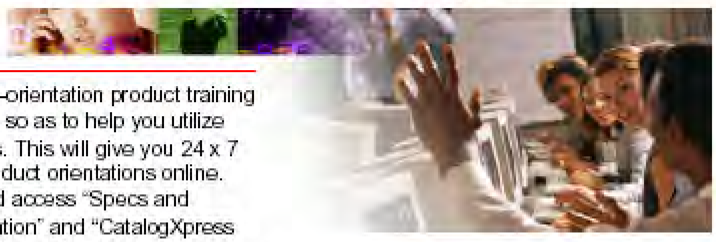
Fax:	303-397-2599
E-mail:	custsvc@ihs.com
Web:	www.ihs.com/support



Training

IHS is providing e-orientation product training via IHS University so as to help you utilize the available tools. This will give you 24 x 7 access to IHS product orientations online. Log on to IHS and access "Specs and Standards Orientation" and "CatalogXpress Orientation" from the main menu.

Accessing IHS Products

Go to the Whole Building Design Guide Website:

http://www.wbdg.org

Choose the DoD Seal from the right. This will open the DoD Unified Criteria Program web page. A link to Information Handling Services is contained in the drop-down menu beneath the USACE seal - "Non-Government Standards - IHS". Click on this link. The web site will automatically log you in to the IHS subscription via your email address.

U.S. Army Corps of Engineers Point of Contact

Robert Billmyre
robert.b.billmyre@hq02.usace.army.mil

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"Daryl.Hammond at Tyndall.af.mil"

"John.Peltz@navy.mil"
"Richard.Cofer@navy.mil"

Any Questions ? ?

Thank - You ! !

Information Technology Systems Criteria

Tri-Service Panel

Fred Skroban – USAISEC

John Peltz – NAVFAC Atlantic

Information Technology Systems Criteria

- Introductions
- Planning for the Future
- Governing Documentation
- Commercial Standards
- Industry Trends and Developments

Fred Skroban

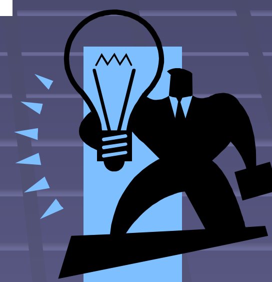
- “SME” for Implementation Engineering
- US Amy Information Systems Engineering Command – Fort Detrick Engineering Directorate
- Background:
  - Employed At ISEC-CONUS/FDEO/FDED Since February 1990
  - Background in DATA QA and Test, BRAC Design, DPI Relocations, and I3A Implementation Program
  - UFC/UFGS Telecommunications Working Group Member

John Peltz, P.E.

- NAVFAC Atlantic Electrical Engineer
- Background
  - Employed with NAVFAC since 1987
    - Design Division
      - Electrical Designer and Supervisor M/E Spec
    - Engineering Innovation Criteria Office (EICO)
      - Special Assistant for Elec. Engr.
    - Capitol Improvements Elec. Engr.
      - Special Assistant for Elec. Engr.

Planning for the Future

- Graduated from WVU
- Going to be an "Electrical Engineer"
- Have a wife, 2-3 kids, Nissan Maxima, and a schnauzer
- Live in a development in NJ

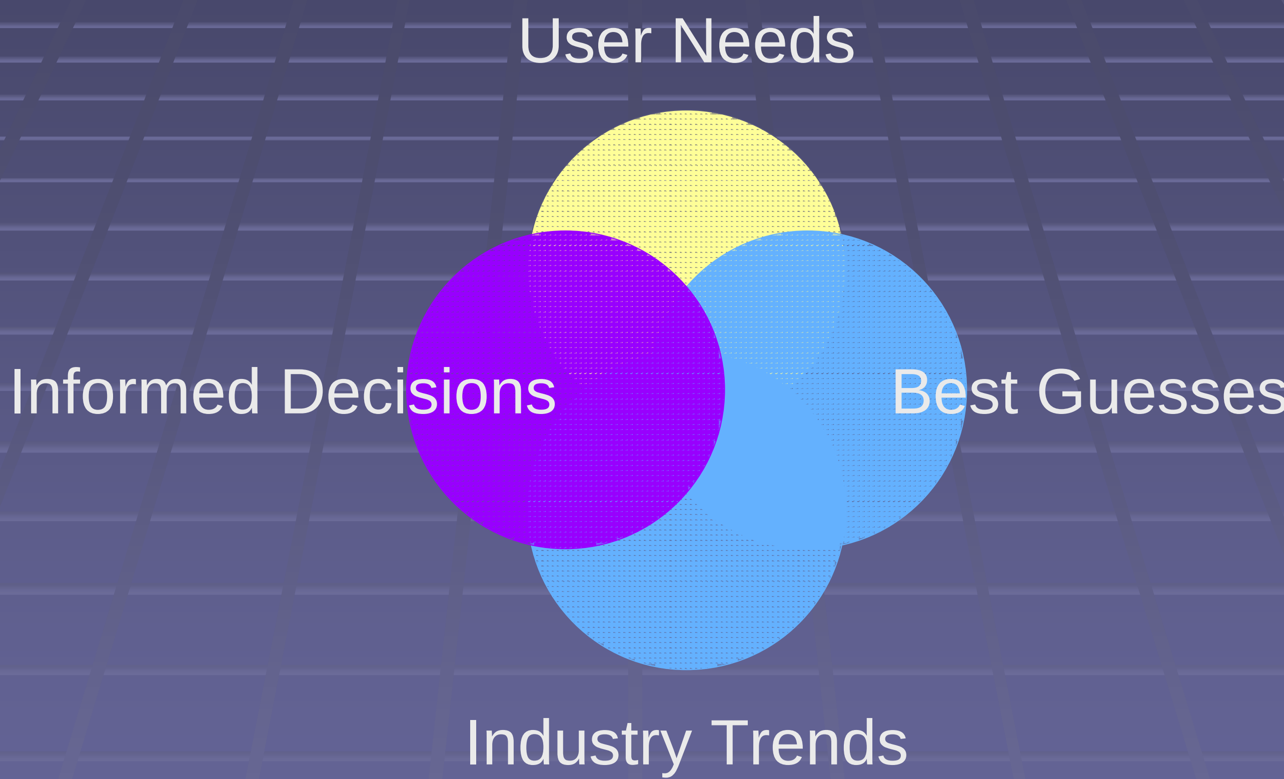


Outcome of Plans

UMUC

- Telecommunications/ IT/ Electronics Engineer - MSIT
- Wife, 4 boys, 2 horses, 2 goats, 7 sheep, sheltie, and a rabbit
- Sentra, mini-van, and pick-up truck
- 7+ acres in rural PA

Planning a Solid Foundation



Information Technology Systems Criteria

- Governed by
  - UFC-3-580-01 - Telecommunications Building Cabling Systems Planning And Design
  - UFC-3-580-02 - Telecommunications Systems Outside Plant Cabling System Planning And Design – DRAFT
  - UFC-3-580-10N - Design: Navy and Marine Corp Intranet (NMCI) Standard Construction Practices

Information Technology Systems Criteria

- Governed by – cont.
  - UFGS 16710 – Building Telecommunications Cabling System
  - UFGS 16711 - Telecommunications Outside Plant (OSP)
  - UFGS 16402 – Interior Distribution System
    - Electrical Systems Supporting Structure
  - UFGS 16720N - Administrative Telephone Equipment, Inside Plant

Commercial Building Cabling Standards

- ANSI/TIA/EIA-568-B Series - Cabling
- ANSI/TIA/EIA-569-B - Pathways
- ANSI/TIA/EIA-606-A - Administration
- ANSI/TIA/EIA-862 – Building Automation
- ANSI/TIA/EIA-526-7 – SM Fiber Testing
- ANSI/TIA/EIA-526-14-A – MM Fiber Testing
- ANSI/TIA/EIA-942 – Data Centers

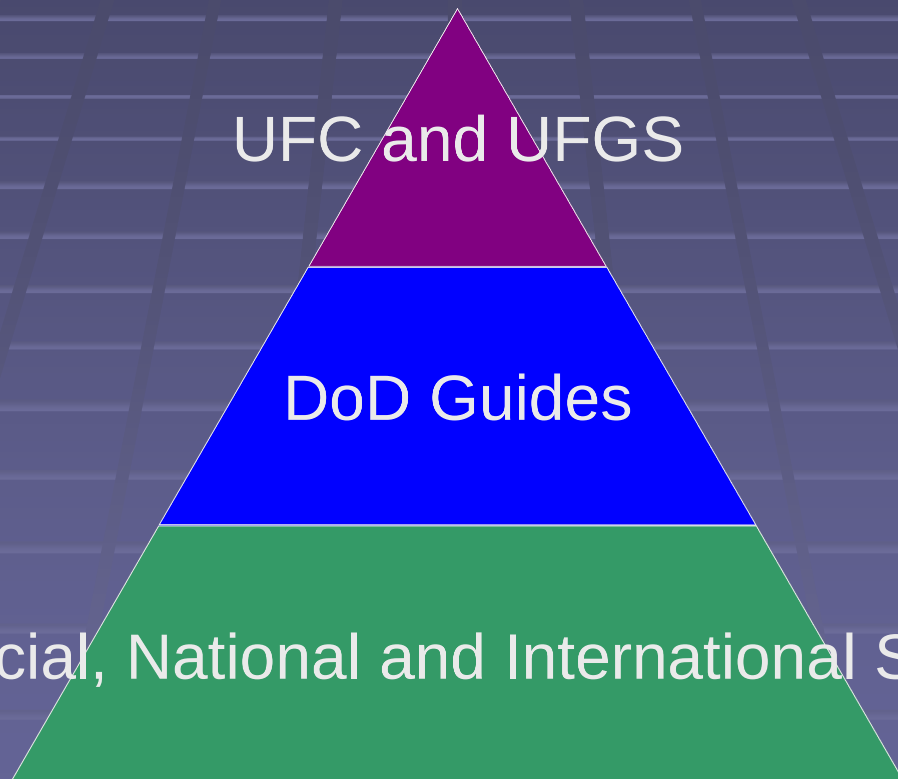
Commercial Outside Plant Standards

- USDA Rural Utilities Service (RUS) Standards
- ANSI/TIA/EIA-758
- Telcordia Documents
- Lucent Documents
- IEEE
- IEC/ISO
- EN

DoD Guides

- Installation Information Infrastructure Architecture (I3A) Guide
- UFC 3-580-10N, Design: Navy and Marine Corp Intranet (NMCI) Standard Construction Practices

Standards Process



IT Procurement Process

- I3A Guidance
  - MCA
  - I3MP
  - Modularity
  - Range Modernization
- NMCI (Data) combined with BCO/G6 (Voice)

US Army Guides

- Installation Information Infrastructure Architecture (I3A) Guide
  - Premise Wiring
  - OSP
  - Voice Switch Central Office and Remote Offices
  - Network Architecture
  - Network and Systems Management
  - Information Assurance and Security

ISEC-FDED MCA Role

- Provide IT functional, technical and program management support to HQDA (CIO/G6 and HQDA G3 and ACSIM), USACE districts, IMA/RCIO's and DOIM's to support planning and programming
- Synchronization of Army Information System Programs I3MP, DSSMP, range projects etc.
- Work with the USACE Districts on each MCA and BRAC project
- Providing external guidance and direction on information system design, assess, plan and execute

US Army I3MP Effort

- Installation Information Infrastructure Modernization Program (I3MP) –
  - OSP
  - Telecommunications Rooms
  - Data
  - Voice
  - ADRP
  - TLA Stack

DSSMP is the current contract vehicle

DSSMP is not a program

US Army I3MP Effort – cont.

- Site Survey
  - Dial Central Office (DCO) and Main Communications Node (MCN)
  - Manholes and Cable Route
  - Building Telecommunications Rooms
  - DOIM Operations
  - User Needs

Army Modularity

- Determine Where Permanent vs. Temporary Facilities Will Be Constructed
  - Determine Type Of IT Solution (Direct Bury vs. MH And Duct, FSO, etc.)
  - Validate The IT OPA Dollars Being Requested
  - Validate The IT OPA Shortfall Potential

Range Infrastructure

- Participating on the Army Range Tech Team to ensure the integrated planned and execution process that supports Range Transformation
- HQDA G3 agreed to fund the range connectivity of 10,000 LF or less from the nearest main post connection point
- HQDA CIO/G6 agreed to fund the range connectivity for greater than 10,000 LF as an Un-Financed Requirement
- UFR validation to the CIO/G6 is based on Tech Team review, design phases and certification of DD1391's

Navy and Marine Corp Intranet (NMCI) Contract

- Awarded 6 Oct 2000.
- Seven year base period plus an optional three-one year extension period.
- "Seat management" contract.
- Ensures standardization and interoperability- Provides all 'IT' hardware and software, operations, training, maintenance and system upgrades.
- Navy conference 21 Sept. 2005 to update the standard and address lessons learned.

UFC 3-580-10

- UFC 3-580-10, Design: Navy and Marine Corp Intranet (NMCI) Standard Construction Practices
  - General guidance and planning information.
  - Summary of requirements to prepare DoN space.
  - ANSI/EIA/TIA standards.
  - Supports Cat 5e horizontal cabling wired to the T568A configuration.
  - Fiber optic home run not supported.
  - Work area outlets are provided with 1-voice and 1-data jack in a single wall plate.

IT Design Steps

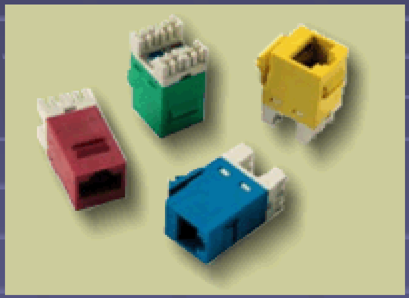
- Determine Building Usage and Occupant's Needs
- Utilize Standards Based Cabling and Technology
- Design to UFC, DoD, and Commercial Standards
  - Lengths
  - Technology Types
  - Constraints

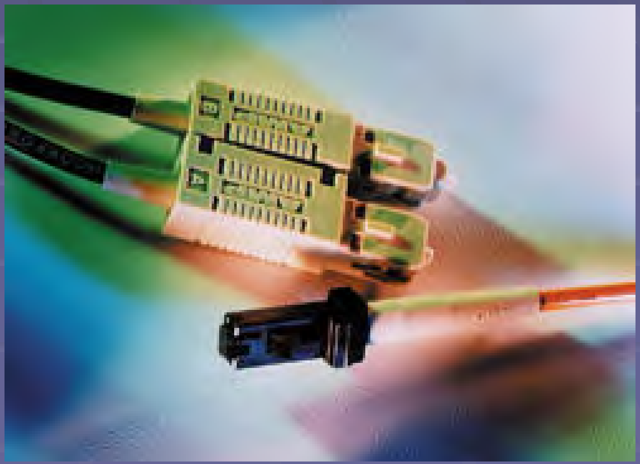
IT Design Steps- Cont.

- Establish a Robust Supporting Structure
  - Outside Plant – Match to Post Infrastructure
  - Maximize Fiber and Sub-Duct for Growth
  - Building Telecommunications – "Flood Wiring"
  - Maximize Re-Usable Structures

IT Design Steps- Cont.

- Cable to Support Current Needs and Growth
- Inject new technologies where appropriate





Industry Trends

- Voice over IP (VoIP)
  - Moving Voice Switching Out to User Buildings
- Wireless LAN (WLAN)
  - IEEE 802.11 a, b, and g
- Power over Ethernet (PoE)
  - Provide Power for IP Phones and Wireless Access Points (WAP)
- Free Space Optics (FSO) for OSP

Affect on IT Design

- VoIP and PoE
  - Need for Continuous Power
  - Greater Power Draw
  - Higher Heat Load
  - More Racks or Cabinets
- Wireless
  - Location of WAP
  - Must Meet DoD Security Requirements

Affect on IT Design

- FSO
  - Distance
  - Installation Stability
  - Inside Window – Reflection or Distortion
  - Atmospheric Effects & Impairments
  - Eye safety
  - Security

Recent Standards

- TIA/EIA-569-B Commercial Building Standard For Telecommunications Pathways And Spaces
  - Added Telecommunications Enclosure
  - Added Information on Furniture Systems
- TIA/EIA-942 Telecommunications Infrastructure Standard For Data Centers

In The Works

- TIA committee TR-42 Working on Standard for 10GBase-T Cabling
  - Technical Service Bulletin (TSB) for “Augmented” Cat 6 – Not Yet Ratified
  - IEEE 802.3an – 10GBASE-T Shielded and Unshielded – Not Yet Published
- ISO/IEC Standard for STP cabling, designated as Class F
- TIA/EIA has not yet formed a task group to explore the standardization of ISO/IEC 11801 Class F as Category 7

In The Works – cont.

- TIA committee TR-42 Working on Standard Wireless Access Points
  - Technical Service Bulletin (TSB) “Telecommunications Cabling Guidelines for Wireless Access Points” – Not Yet Ratified
  - WAP At The Center Of Each 55 by 55 Foot Square Grid - up to 20 users
  - Based on ISO/IEC TR 24704 “Information Technology Customer Premises Cabling for Wireless Access Points”

Question and Answer Time

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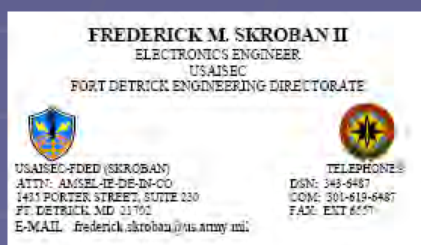

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Louisville District U.S. Army Corps of Engineers

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LEASONS LEARNED FOR AXIAL/MIXED FLOW PROPELLER PUMPS

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Construction , Design Issues and Problems

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Design Criteria

- ***Some lessons learned:***

Get involved with construction activities

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Design Criteria

- ***Get involved with construction activity from shop drawing review to final field inspection***

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Design Criteria

- Get involved with construction activity from shop drawing review to final field inspection
- Develop good working relationship with Construction Office

Design Criteria

- *Get involved with construction activity from shop drawing review to final field inspection*
- *Develop good working relationship with Construction Office*
- *Demonstrate to them how important your input is*

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Design Criteria

- ***Include your involvement in the Engineering Construction Instructions (ECIs)***

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Design Criteria

- ***Include your involvement in the ECIs***
- ***Make your presence known in shop/field***

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Design Criteria

- Include your involvement in the ECIs
- Make your presence known in shop/field
- Ask questions

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Need Effective CQC Program

- ***Enforce Contractor Quality Control program***

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Need Effective CQC Program

- Enforce Contractor Quality Control program
- Get to know Quality Control person for pump manufacturer

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Need Effective CQC Program

- Enforce Contractor Quality Control program
- Get to know Quality Control person for pump manufacturer
- Review Contractor Quality Control plan

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Need Effective CQC Program

- *Enforce Contractor Quality Control program*
- *Get to know Quality Control person for pump manufacturer*
- *Review Contractor Quality Control plan*
- *Ensure Contractor Quality Control plan includes pump manufacturer activities*

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Need Effective CQC Program

- Require preparatory inspection for pump manufacture

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Need Effective CQC Program

- *Require preparatory inspection for pump manufacture*
- *Attend Preparatory and Initial Inspections*

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Need Effective CQC Program

- Require preparatory inspection for pump manufacture
- Attend Preparatory and Initial Inspection
- Review Follow-up inspection reports

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Contract Requirements

- ***Read and understand contract specifications (technical and nontechnical).***

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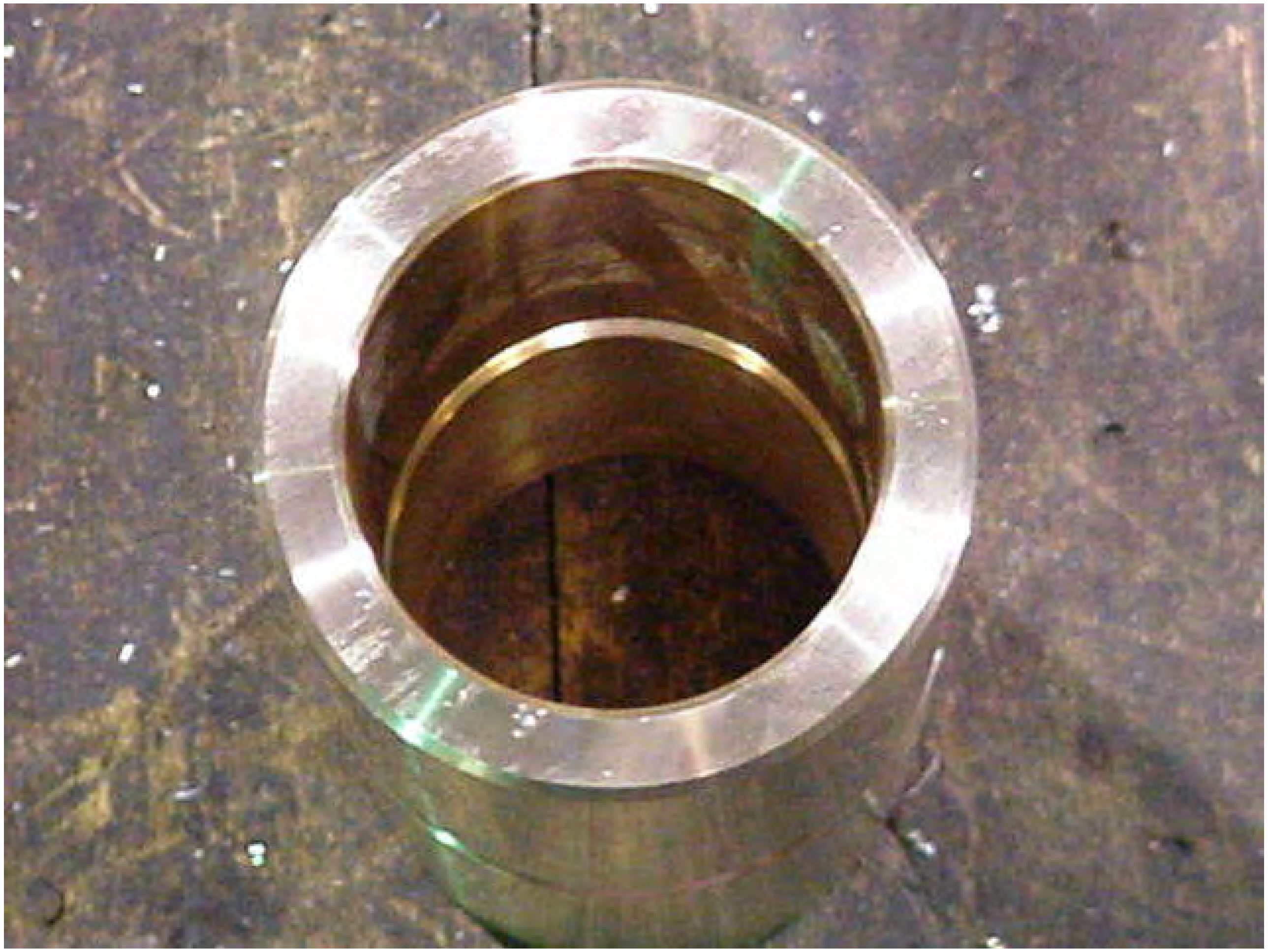

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Bottom of Impeller Hub Pump #2 (Note: Weights Welded in Hub)

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Contract Requirements

- *Read and understand contract specifications (technical and nontechnical).*
- *Read and understand referenced industry standards*

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Contract Requirements

- Read and understand contract specifications (technical and nontechnical).
- Read and understand referenced industry standards
- Obtain copy of referenced industry standards

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Contract Requirements

- Read and understand contract specifications (technical and nontechnical).
- Read and understand referenced industry standards
- Obtain copy of referenced industry standards
- Ask to see contractors copy of industry standards

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Shop Drawings

- *Be familiar with the shop drawings.*

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Shop Drawings

- *Be familiar with the shop drawings.*
- *Ensure contractor has approved shop drawings on-site*

Shop Drawings

- *Be familiar with the shop drawings.*
- *Ensure contractor has approved shop drawings on-site*
- *Check that shop and manufacturing drawings agree*

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Shop Drawings

- Be familiar with the shop drawings.
- Ensure contractor has approved shop drawings on-site
- Check that shop and manufacturing drawings agree
- Check manufacture in accordance with shop/manufacturing drawings

Review/Witness Assembly Procedures

- *Witness Factory Assembly*

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Review/Witness Assembly Procedures

- *Witness field assembly*

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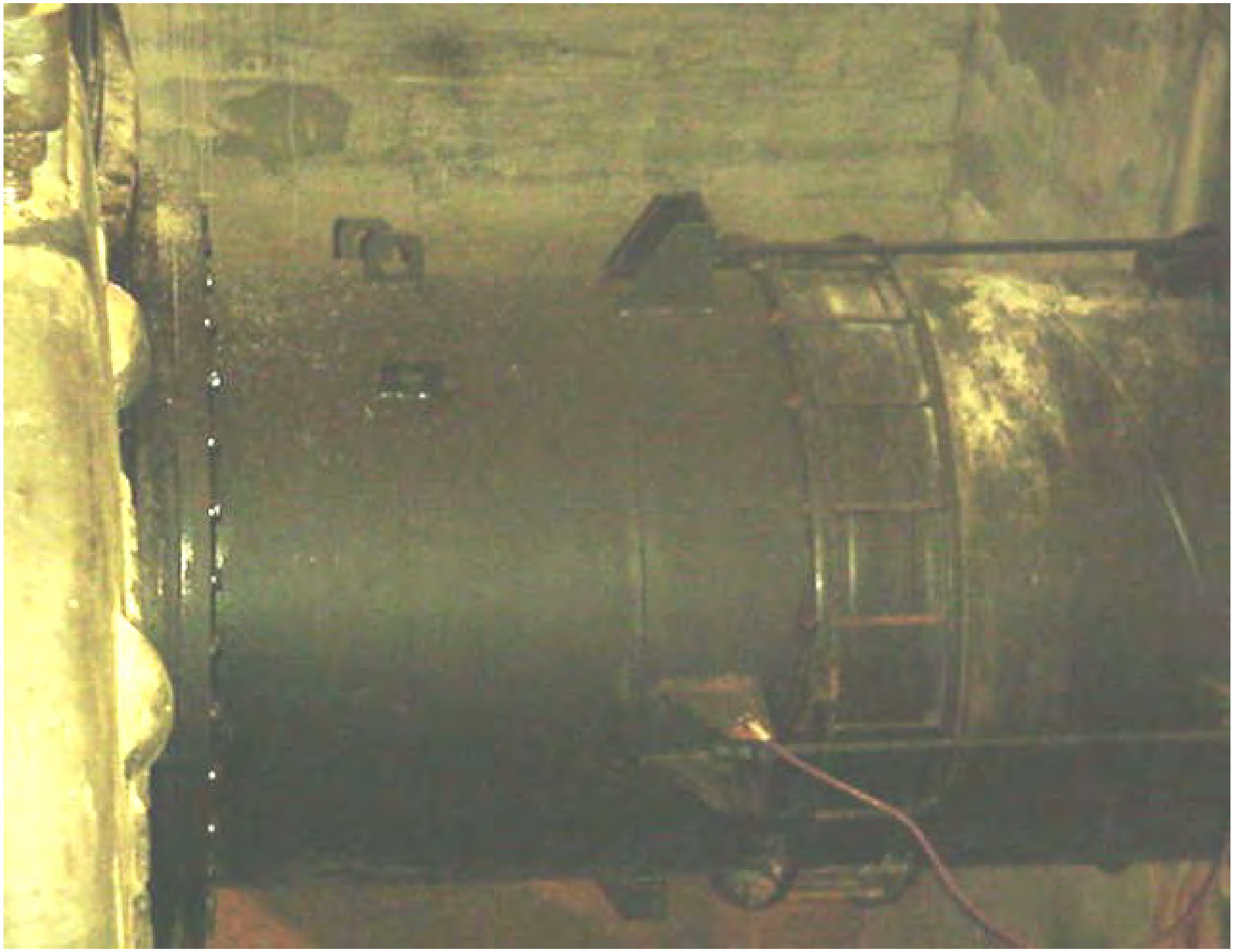

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Factory/Field Tests

- ***Check calibration of testing equipment.***

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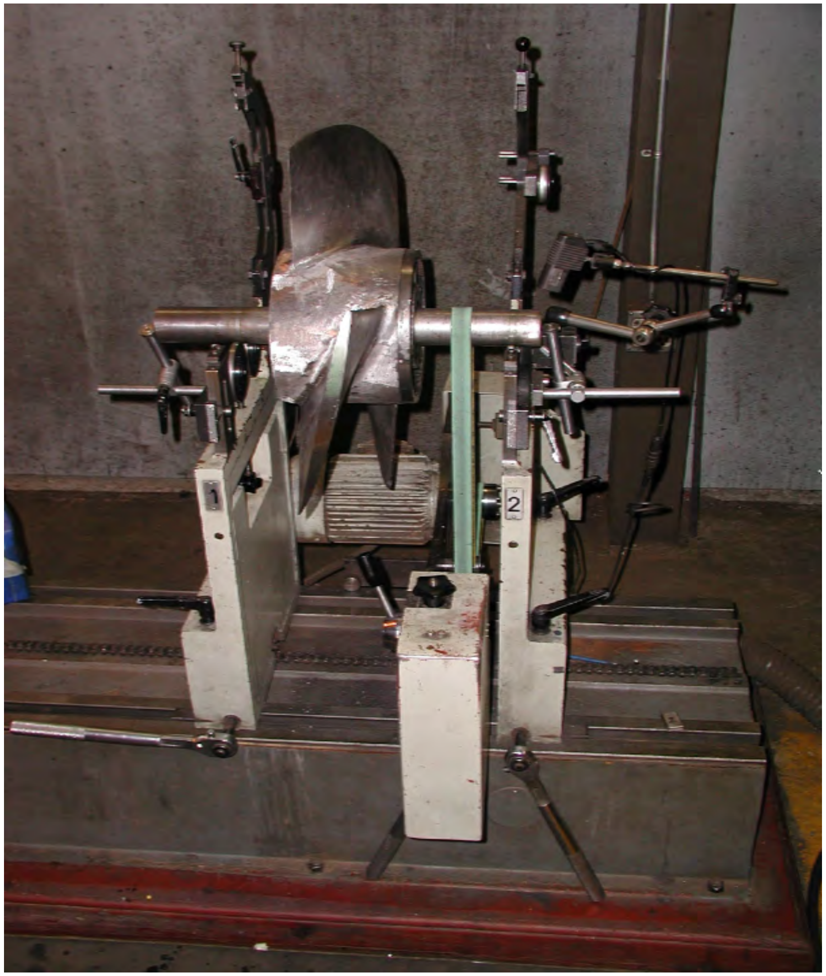
Impeller #2 on Balance Machine



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Factory/Field Tests

- Check calibration of testing equipment.
- Review testing procedures

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Factory/Field Tests

- Check calibration of testing equipment.
- Review testing procedures
- Attend factory test

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Factory/Field Tests

- *Check calibration of testing equipment.*
- *Review testing procedures*
- *Attend factory test*
- *Attend field tests*

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ESSAYONS
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ENGINEER

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HELP!!!!

- ***Ask for help from other Corps offices or Headquarters in Washington DC***

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HELP!!!!

- *Ask for help from other Corps offices or Headquarters in Washington DC*
- *Why is this important?*

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HELP!!!!

- ***Pumps are complex, built to close tolerances, requiring highly skilled craftsmen***

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HELP!!!!

- *Pumps are complex, built to close tolerances, requiring highly skilled craftsmen*
- *Pumps are a combination of castings (impeller), forgings (shaft), and weldments (column)*

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HELP!!!!

- ***Each pump is built independently, specifically for your project***

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HELP!!!!

- ***Each pump is built independently, specifically for your project***
- ***Quality of construction will determine success or failure of pump***

Quality of Construction

- *Quality of construction depends on:*

Quality of Construction

- ***Skill level of workers, i.e., machinists, foundry workers, and welders.***

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Quality of Construction

- Skill level of workers, i.e., machinists, foundry workers,
- Built in accordance with shop drawings, manufacturing drawings

Quality of Construction

- Skill level of workers, i.e., machinists, foundry workers,
- Built in accordance with shop drawings, manufacturing drawings
- Cleanliness of shop

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Quality of Construction

- Skill level of workers, i.e., machinists, foundry workers,
- Built in accordance with shop drawings, manufacturing drawings
- Cleanliness of shop
- Assembly/disassembly procedures

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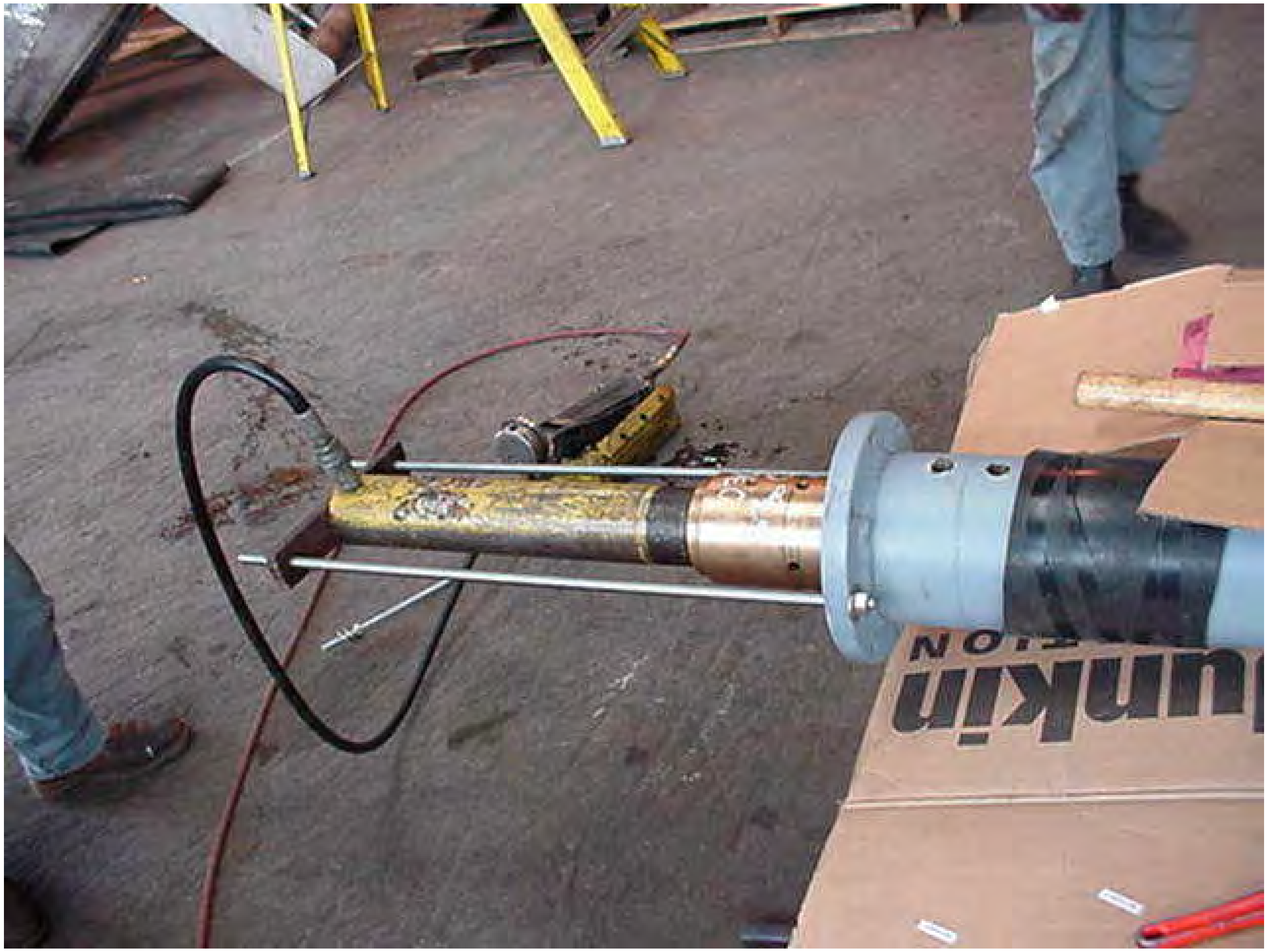

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Quality of Construction

- ***Storage and Handling of equipment/components on-site (factory or field)***

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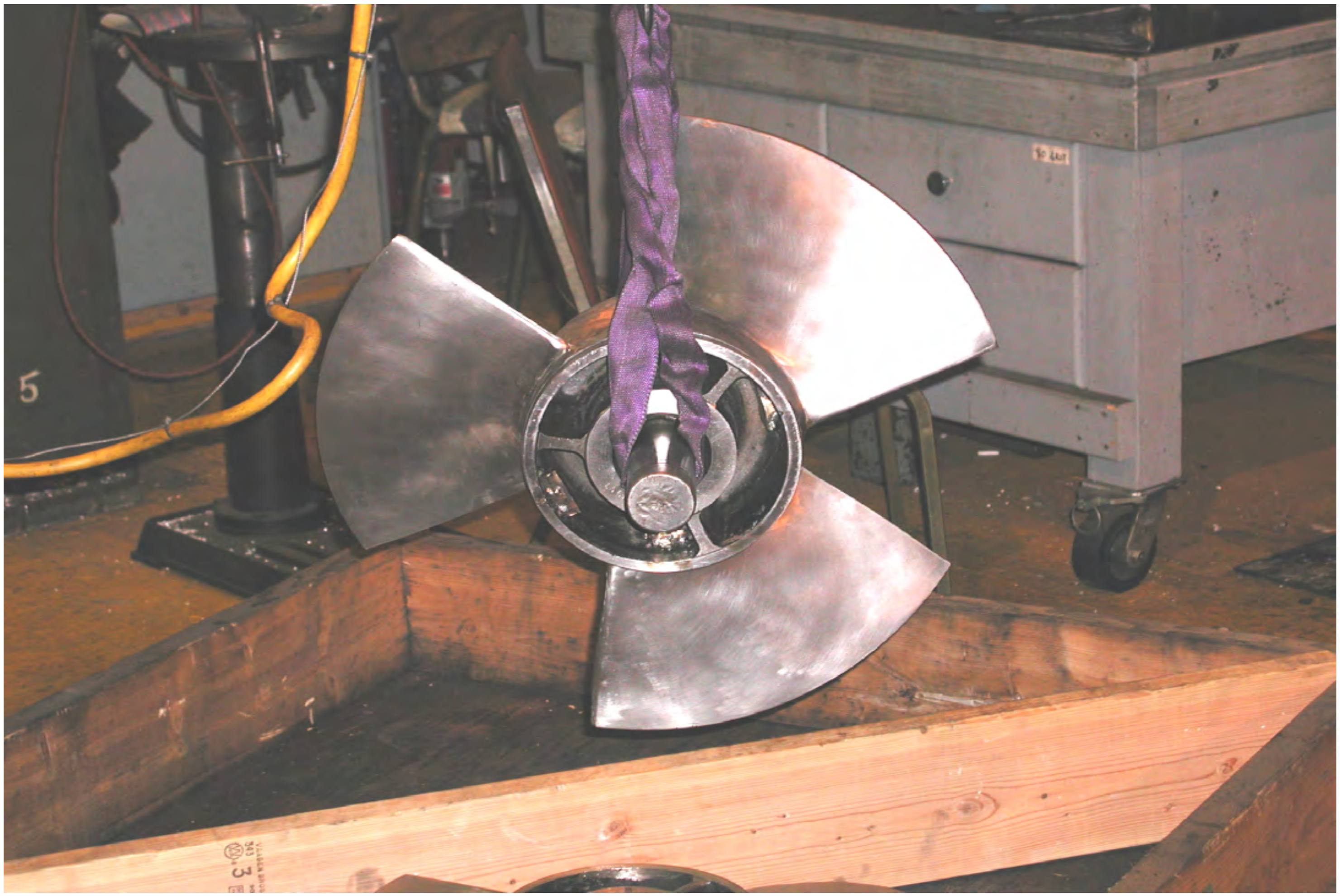
Impeller #1 After Balancing (Note: Weights inside Hub)



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Quality of Construction

- *Storage of equipment/components on-site (factory or field)*
- *Proper material selection, quality standards*

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What Can Go Wrong?

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What Can Go Wrong?

Seized or Damaged Bearings

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What Can Go Wrong?

Seized or Damaged Bearings :

- Improper clearance

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What Can Go Wrong?

Seized or Damaged Bearings :

- Improper clearance
- Wrong surface finish

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What Can Go Wrong?

Seized or Damaged Bearings :

- Improper clearance
- Wrong surface finish
- Shaft misalignment

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What Can Go Wrong?

Seized or Damaged Bearings :

- Improper clearance
- Wrong surface finish
- Shaft misalignment
- Bearing misalignment

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What Can Go Wrong?

Seized or Damaged Bearings :

- **Improper clearance**
- **Wrong surface finish**
- **Shaft misalignment**
- **Bearing misalignment**
- **Incorrect or no lubricant**

What Can Go Wrong?

Seized or Damaged Bearings *cont:*

- ***Imbalance of Impeller or Propeller***

What Can Go Wrong?

Seized or Damaged Bearings *cont:*

- ***Imbalance of Impeller or Propeller***
- ***Contamination by sand, silt or other foreign materials within the shaft or bearing housing***

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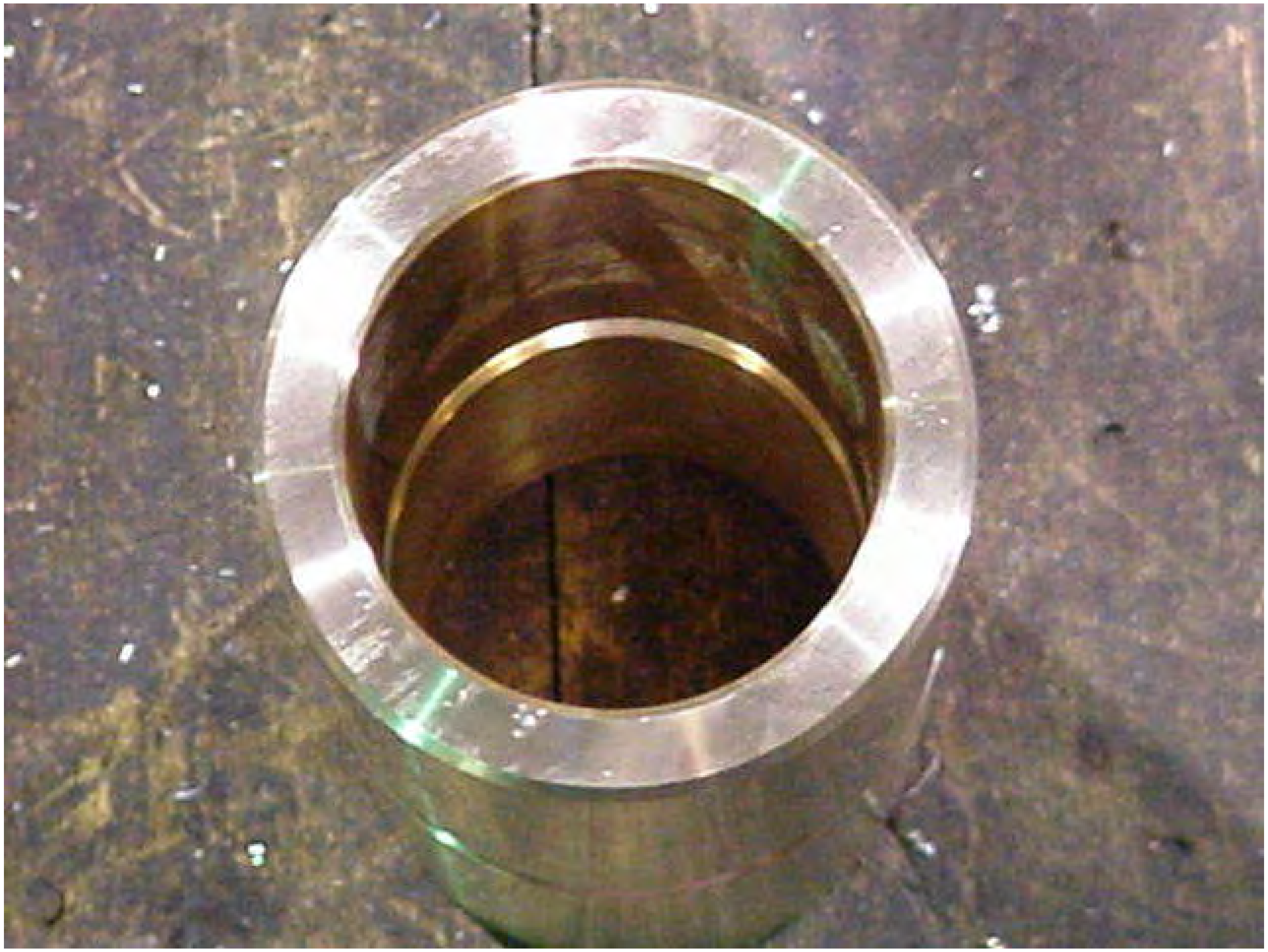

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Pump Design

- ***Operate at resonant frequency between the pump and motor can cause vibrations and damage the pump.***

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Pump Design

- *Operate at resonant frequency between the pump and motor can cause vibrations and damage the pump.*
- *NPSHR>NPSHA*

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Pump Design

- Operate at resonant frequency between the pump and motor can cause vibrations and damage the pump.
- NPSHR>NPSHA
- Fail performance and/or cavitation test

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DUCK CREEK AUTOMATED GATE CONSIDERATIONS

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Design Issues and Problems

Associated with the Automated Flood Closure Gate

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DESIGN CRITERIA

- ***Engineering Manual EM 1110-2-2705***

STRUCTURAL DESIGN OF CLOSURE STRUCTURES FOR LOCAL FLOOD PROTECTION PROJECTS

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DESIGN CRITERIA

- *There are numerous types of closure structures or gates for openings in levees and floodwalls gates shown in the Engineering Manual*

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DESIGN CRITERIA

1. STEEL SWING

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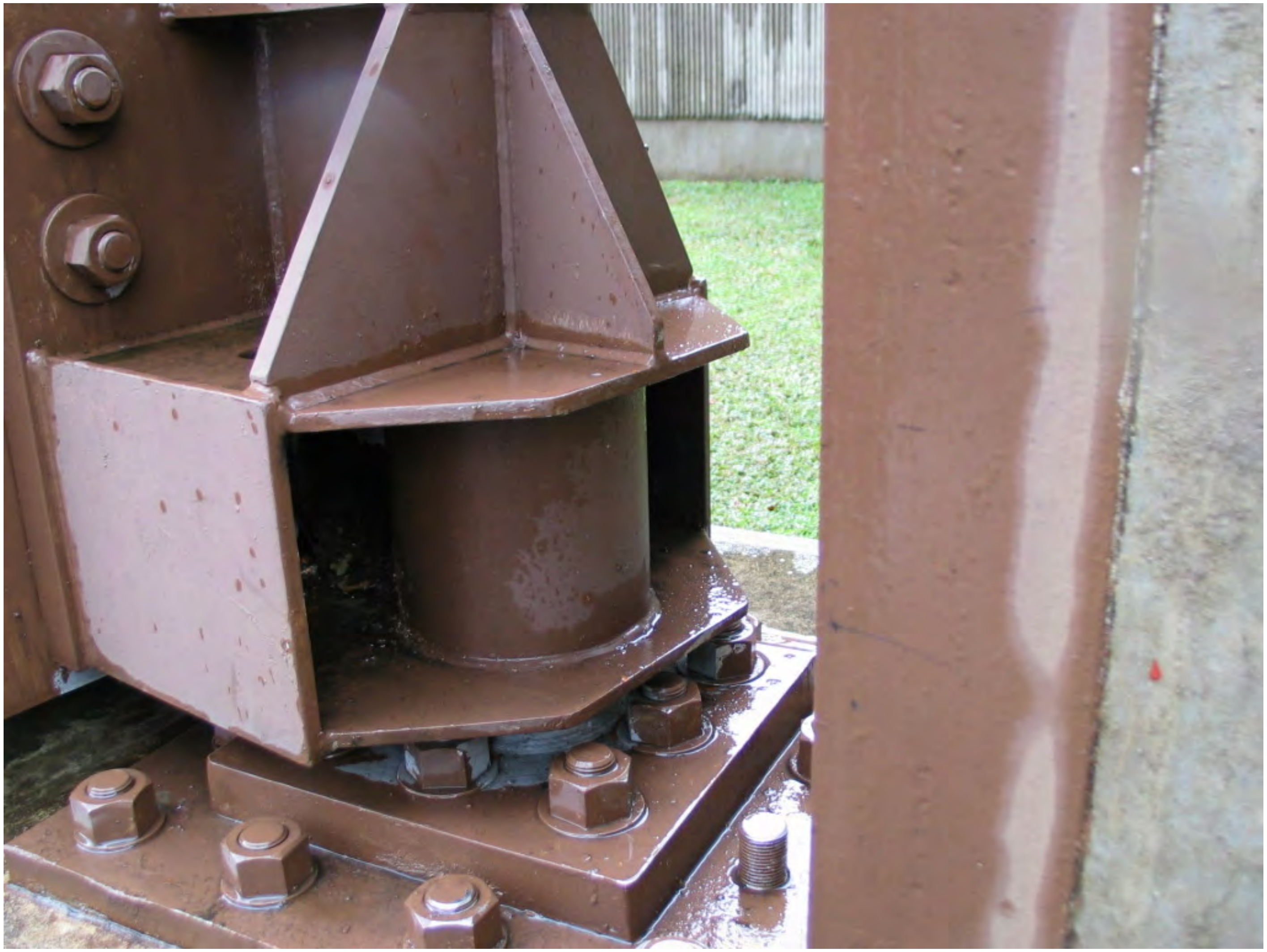

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DESIGN CRITERIA

- 1. STEEL SWING
- 2. MITER

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DESIGN CRITERIA

- 1. STEEL SWING
- 2. MITER
- 3. TROLLEY

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DESIGN CRITERIA

- 1. STEEL SWING
- 2. MITER
- 3. TROLLEY
- 4. ROLLING GATE

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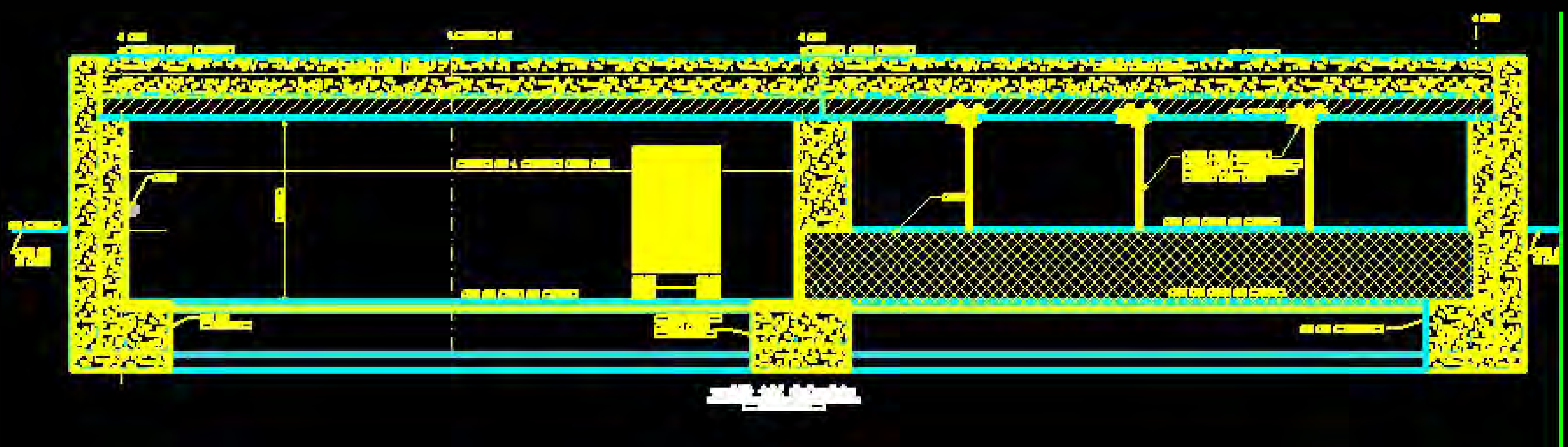
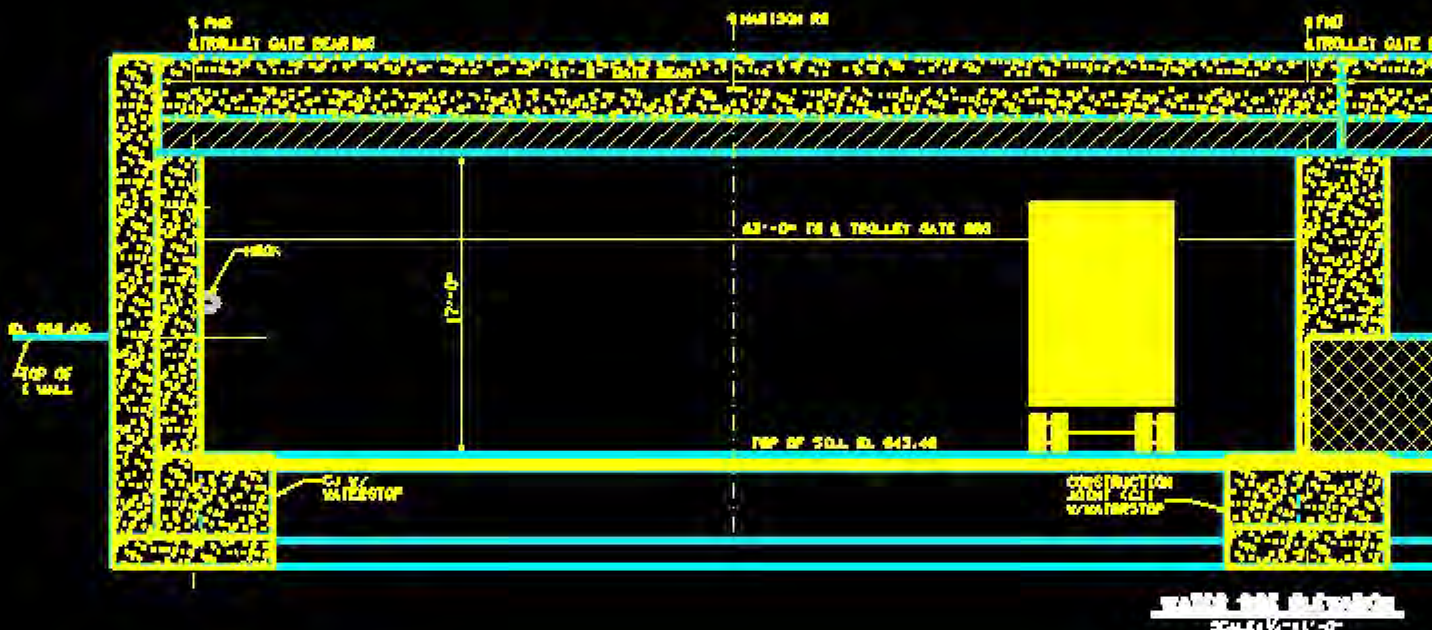
Design criteria

- ***There are several different types of gates listed and information in the Engineering Manual that provides design guidance for the structural closures for openings in levees and floodwalls of inland local flood protection projects***

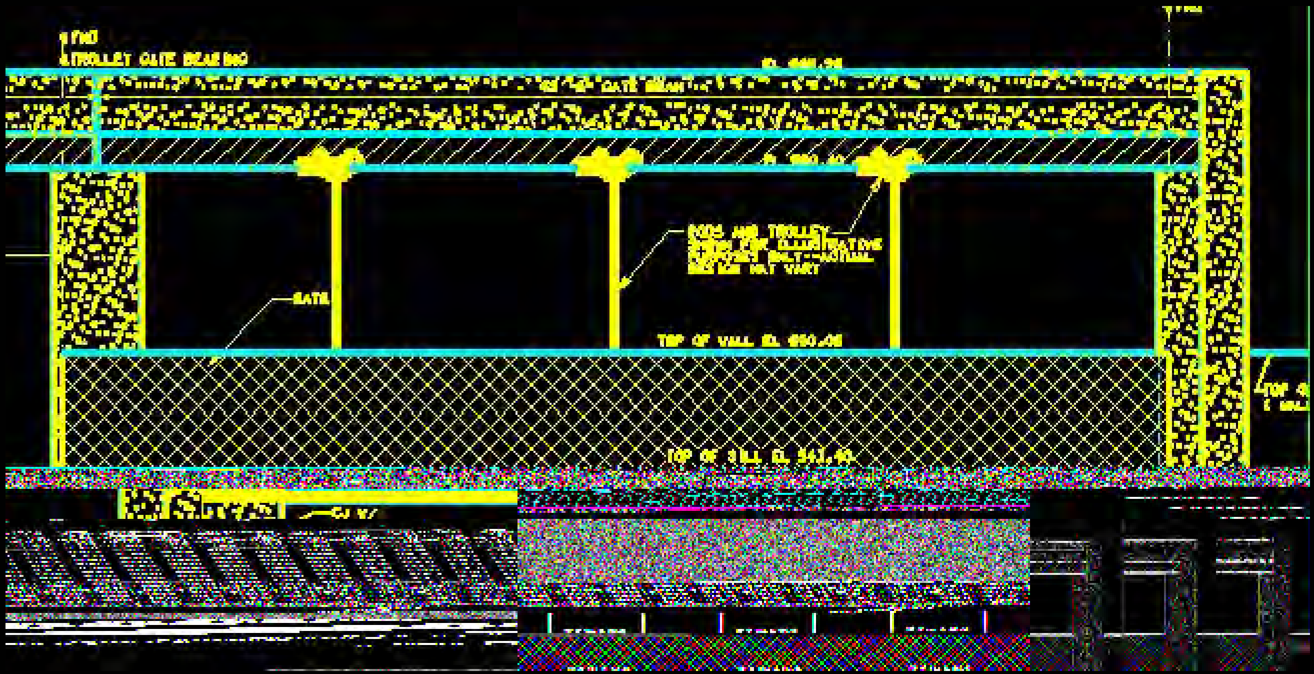
Duck Creek Automated Gate Closure Using the Trolley Design (Note the Overhead Beam that is Required for This Type of Design



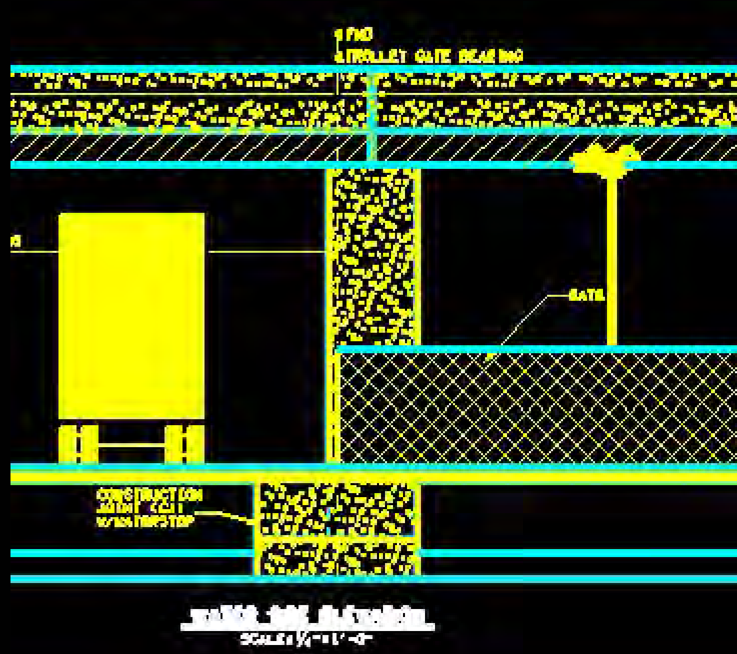
Road Opening Where Automated Gate Closes Road



Automated Gate with Trolley Attachments



Trolley Gate with Truck Shown in Road



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Design criteria

1. Steel Swing
2. Miter
3. Trolley
4. Rolling Gate

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Design criteria

- *FIRST SUGGESTED THE USE OF AN OVERHEAD GATE THAT WOULD BE POSITIONED OVER THE ROAD. THIS WOULD HAVE BEEN A BETTER DESIGN BUT THERE WAS A FEAR THAT THE GATE WOULD FALL AND POSSIBLE INJURY SOMEONE.*

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Design criteria

- THE SECOND BRAINSTORMING IDEA WAS TO USE A TROLLEY TYPE DESIGN TO HELP ASSIST THE GATE ACROSS THE ROAD.
- THIS IS WHAT WAS ORIGNALLY STARTED FOR THE DESIGN OF THE CLOSURE GATE.

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Design criteria

- ***THIS WAS A GOOD IDEA AND HAD BEEN USED BY THE HUNTSVILLE DISTRICT WITH WEST VIRGINIA AS YOU CAN SEE BY THE FOLLOWING PHOTOS.***

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Plan View of the Location for the Automated Gate

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THIS TYPE OF DESIGN WOULD NOT WORK FOR THE FOLLOWING REASON:

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DESIGN INFORMATION

- 1. THE GATE WAS APPROXIMATELY 70 FEET IN LENGTH AND WOULD SWAY TO MUCH DUE TO WIND LOAD.

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DESIGN INFORMATION

- *1. THE GATE WAS APPROXIMATELY 70 FEET IN LENGTH AND WOULD SWAY TO MUCH DUE TO WIND LOAD.*
- *2. THE GATE WAS ONLY SUPPORTED BY THE TROLLEY AND SINCE IT WAS AUTOMATED THE GATE WOULD HAVE TO SEAT WITH OUT ANY MAINTENANCE PERSONNEL AT THE SITE*

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DESIGN INFORMATION

- THEREFORE WE THEN LOOKED AT ANOTHER OPTION SUCH AS THE ONE WE USE ON MITER GATES, WHICH IS A RACK AND PINOIN TYPE SYSTEM AS SHOWN IN THE FOLLOWING PHOTO.

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DESIGN INFORMATION

- *THE RACK AND PINOIN SYSTEM WOULD HAVE REQUIRED SUCH PRECISION TYPE MACHINING AND PLACEMENT OF THE COMPONENTS THAT IT WAS DETERMINED NOT BE THE RIGHT TYPE OF DESIGN FOR THIS APPLICATION*

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DESIGN INFORMATION

- I THEN PROPOSED THE FOLLOWING IDEA THAT LED TO THE DESIGN OF THE CLOSURE SYSTEM TO BE A WINCH TYPE SYSTEM WHICH IS TYPICALLY USED TO MOVE RAILROAD CARS.

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DESIGN INFORMATION

- THE PROBLEM WAS FINDING A CUSTOM TYPE WINCH TO BE USED TO PULL THE GATE ACROSS THE ROAD AND THEN BACK TO ITS ORIGINAL STORED POSITION

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DESIGN INFORMATION

- I CONSULTED **RUSSEL WITTEN IN THE HUNTSVILLE DISTRICT** ABOUT THIS TYPE OF WINCH DESIGN AND HE INFORMED ME OF THE FOLLOWING COMPANY **SUPERIOR LIDGERWOOD MUNDY OF SUPERIOR WISCONSIN**

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DESIGN INFORMATION

- I HAD A VERY SHORT DESIGN SCHEDULE AND WAS PROVIDED INFORMATION FROM KEVIN BERG AND DAVE BEATTY FROM SUPERIOR LIDGERWOOD MUNDY TO HELP ME WITH THE CADD DRAWINGS FOR THE WINCH TO MEET THE SCHEDULE

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DESIGN INFORMATION

- WORKING CLOSELY WITH THE STRUCTURAL DESIGN ENGINEER WE WERE ABLE TO COMPLETE THE DESIGN ON SCHEDULE. THE WINCH IS PLACED NEAR THE OPENING SO THAT IT USED TO PULL THE GATE ACROSS THE ROAD AND BACK TO STORAGE.

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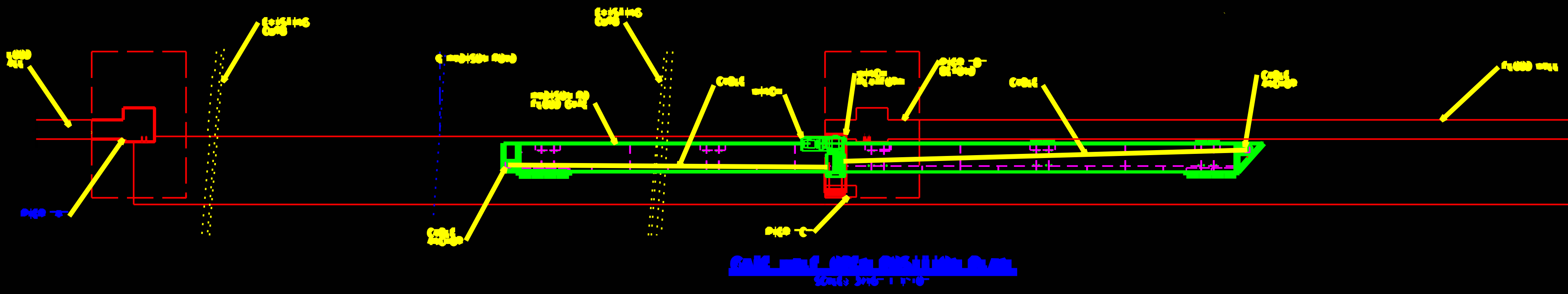
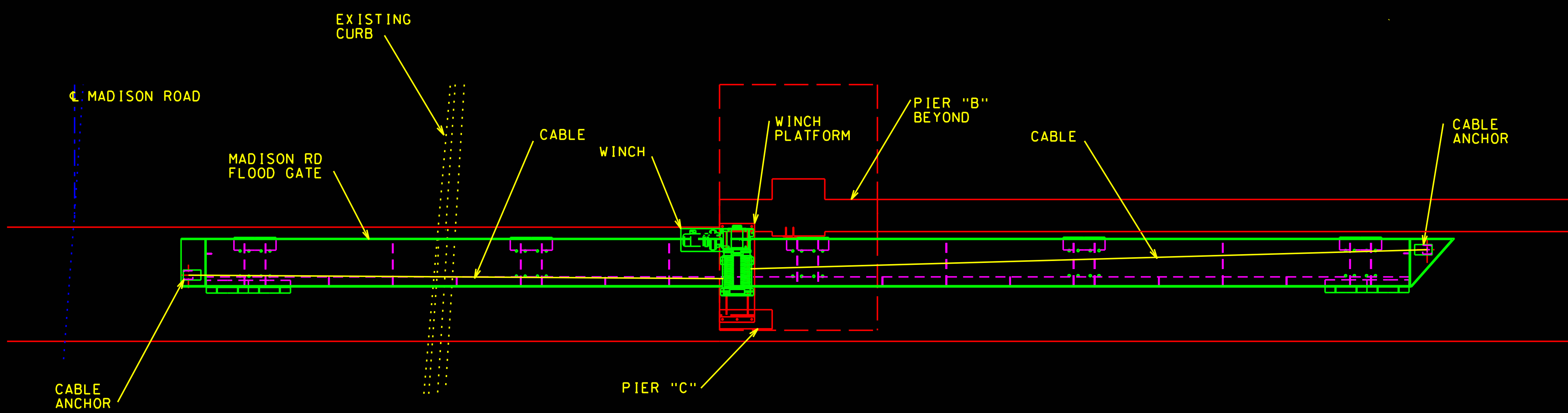
DESIGN INFORMATION

- REVIEWERS OF THE DESIGN COULD NOT UNDERSTAND HOW THIS WOULD WORK, THEY COMMENTED THAT THE REQUIRED A PLAN AND SECTION AS INDICATED IN THE FOLLOWING SLIDE:

PLAN VIEW OF GATE & WINCH

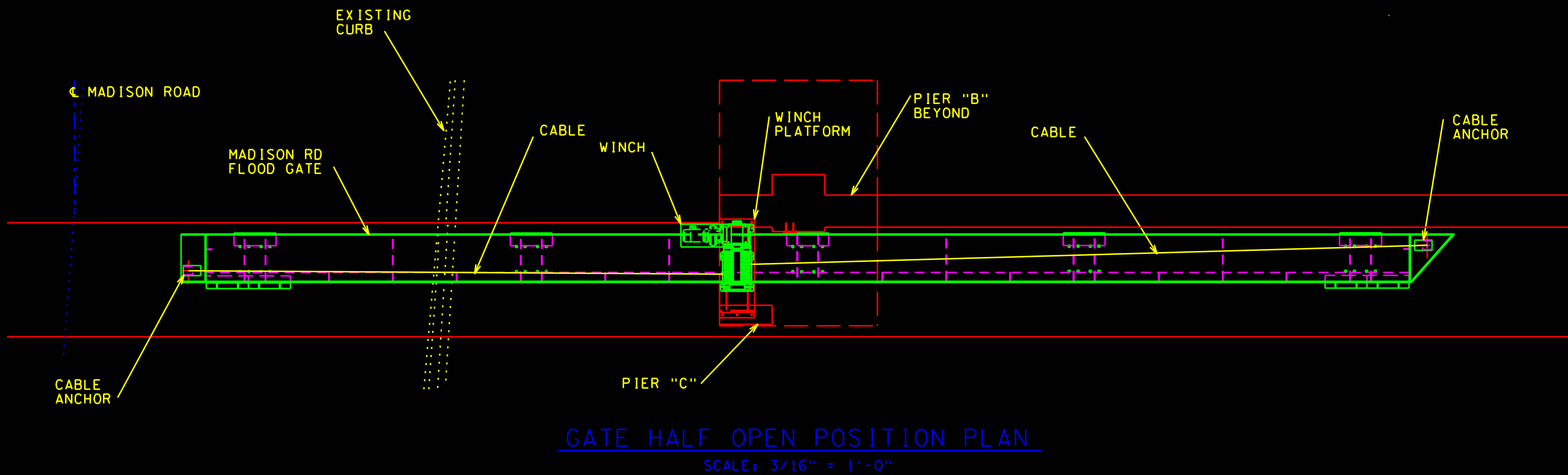




GATE HALF OPEN POSITION PLAN

SCALE: 3/16" = 1'-0"

ENLARGEMENT OF GATE & WINCH



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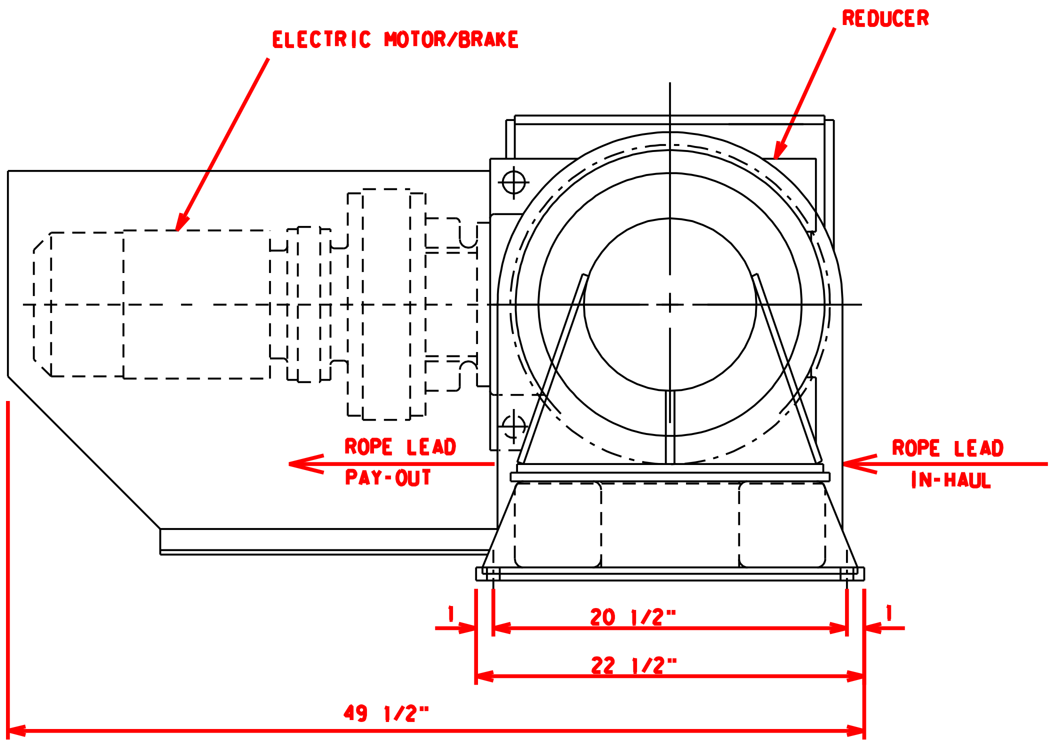
SIDE VIEW OF WINCH



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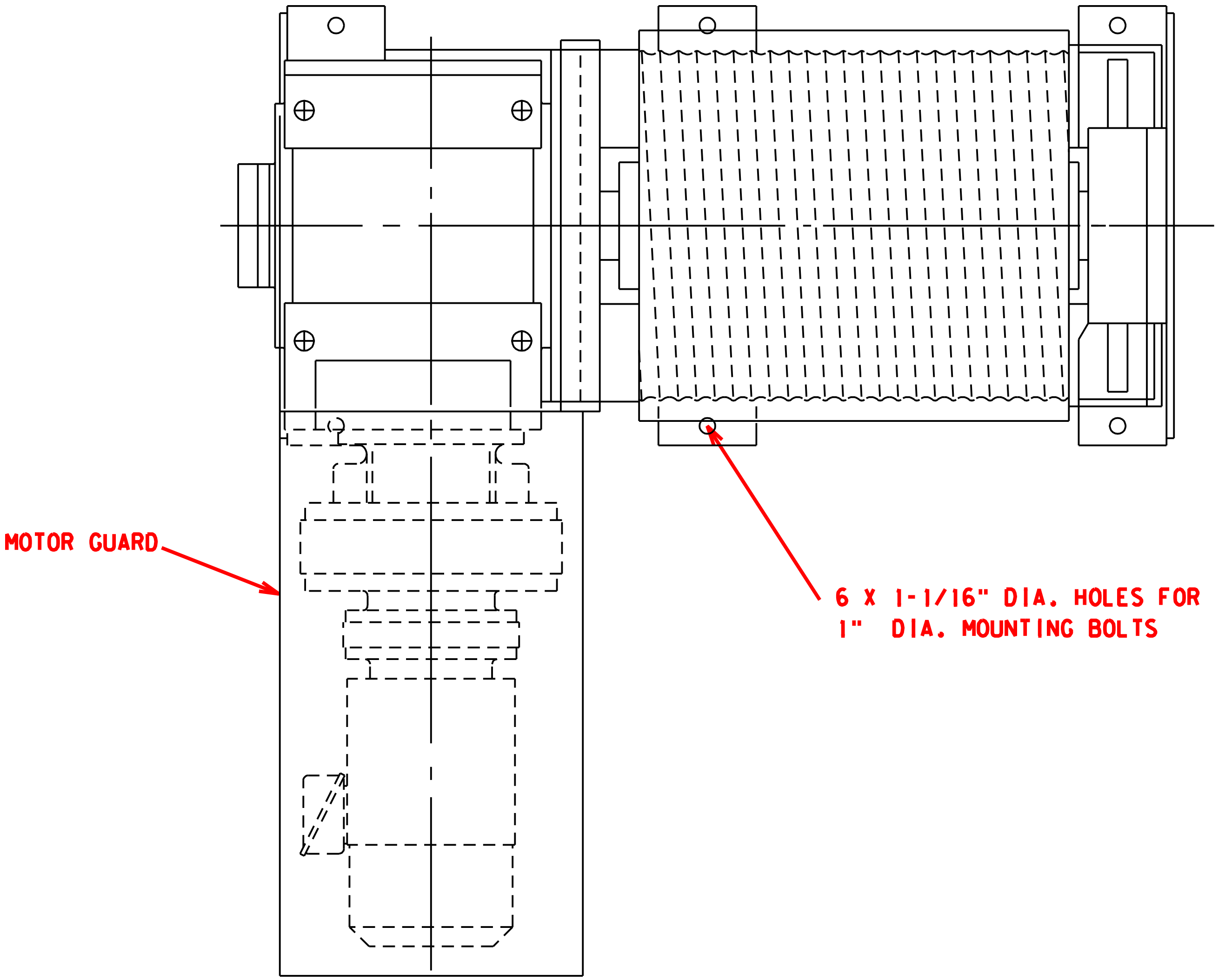
TOP VIEW OF WINCH WITH A SINGLE DRUM



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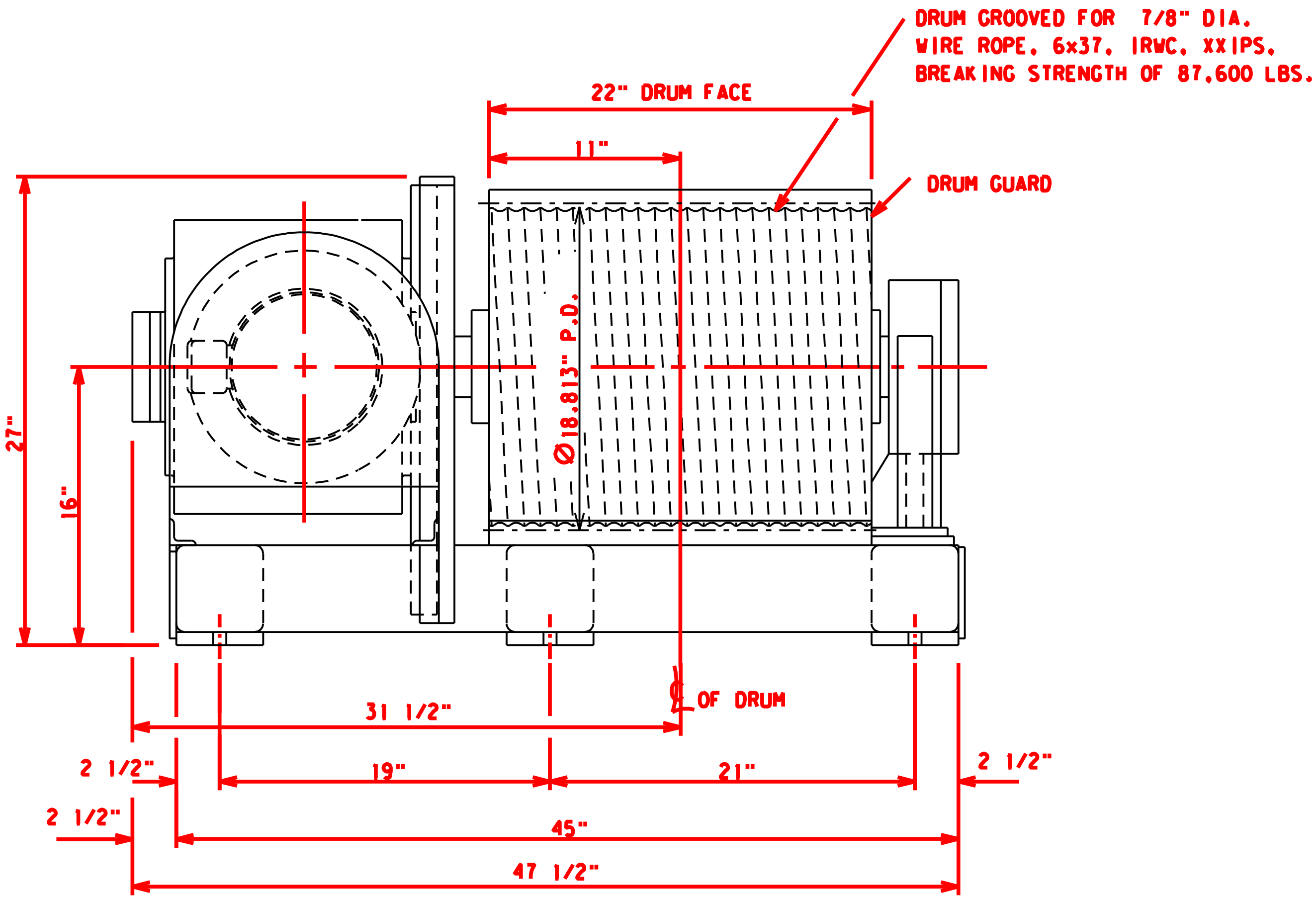
SIDE VIEW OF ELECTRIC WINCH



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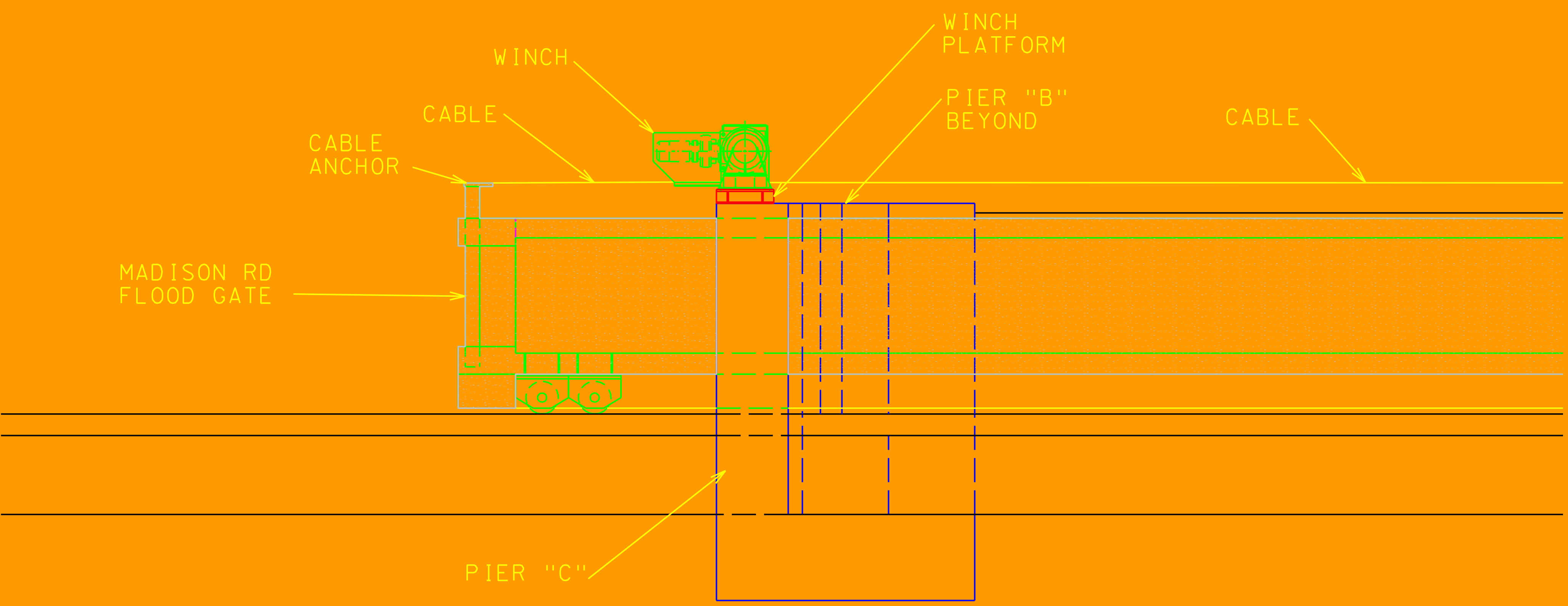
Enlargement of Winch and Gate



GATE OPEN POSITION ELEVATION
SCALE: 3/16" = 1'-0"

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DESIGN INFORMATION

- ONE MAJOR CONCERN FROM THE LOCAL SPONSOR CINCINNATI MSD WAS THE FEAR THAT THE WINCH CABLE MIGHT FAIL AND INJURY SOMEONE

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DESIGN INFORMATION

- I INFORMED THEM THE WINCH AND GATE WAS WELL OVERDESIGNED. THE NORMAL INDUSTRY PRACTICE FOR THE CABLE ON THE WINCH WOULD INCLUDE A FACTORY OF SAFETY OF 3 FOR THE CABLE AGAINST THE OPERATING LOAD.

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DESIGN INFORMATION

- *MY CABLE WAS DESIGNED TO A FACTOR OF SAFETY OF 5 AGAINST THE STARTING LOAD AND THAT THE WINCH WOULD OVERLOAD AT APPROXIMATELY 21,000 LBS. THE CABLE IS DESIGNED FOR A LOAD.*

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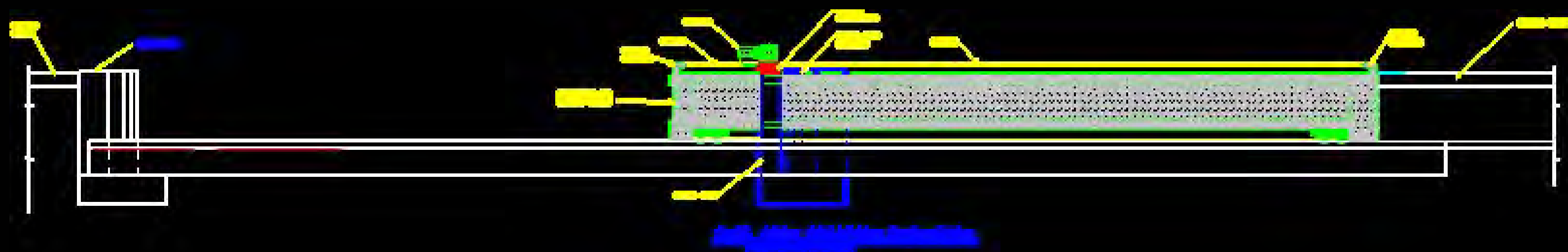
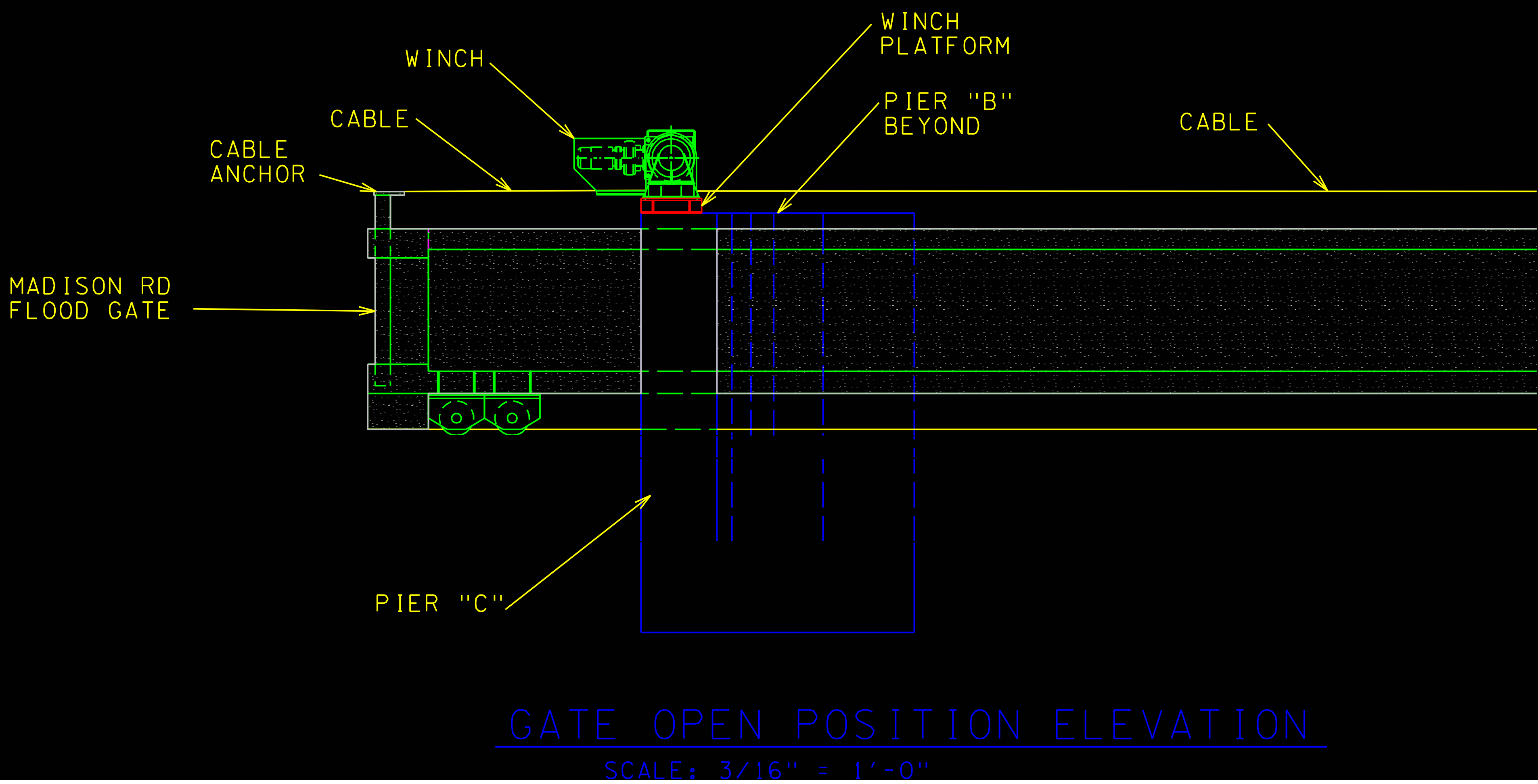
DESIGN INFORMATION

- I PROPOSED THE FOLLOWING IDEA THAT LED TO THE DESIGN OF THE CLOSURE SYSTEM TO BE A WINCH TYPE SYSTEM WHICH IS TYPICALLY USED TO MOVE RAILROAD CARS.

Automated Closure Gate with Winch Design



Automated Closure Gate, Note Winch is Designed to Reel and Unreel with One Drum



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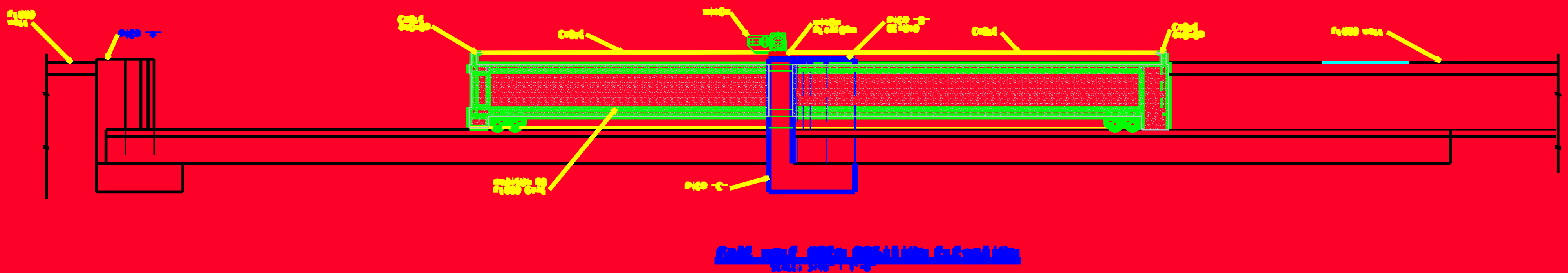
Gate in Half Open or Closed Position



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HydroAMP:
Hydropower Asset Management

Presented by Lori Rux, Ph.D., P.E.
Hydroelectric Design Center
Tri-Service Infrastructure Systems Conference - August 2005

What is HydroAMP?

Asset management tools developed to improve

- Evaluation of hydroelectric equipment
- Prioritization of investments

Objectives

- Background
- Goals, methodology, and principles
- Condition assessments
- Business analyses
- Current status
- What’s next
- Conclusions

Background

In 2001, four organizations began creating an asset management framework.

- Bureau of Reclamation
- Hydro-Québec
- Corps of Engineers
- Bonneville Power Administration

Motivation

- Aging infrastructure
- Generation availability and reliability
- Objective, consistent, and valid assessments
- Strengthen prioritization processes
- Available tools too complex and costly

Goals

- Streamlined condition assessments
- Justify investigations, repairs, and refurbishments
- Strategic business decisions
- Long-term viability and reliability

Methodology

- Assessment tools for major powerhouse equipment
- Field validation
- Computerized data collection, trending, and reporting
- Management tools based on condition, risk, and other factors

Principles

- Objective results
- Developed from routine tests and inspections
- Simple process
- Easy interpretation
- Technically sufficient (not necessarily perfect)
- Consistent and repeatable results
- Multi-agency team effort
- Start small, expand with time
- Open to improvement

Condition Assessments

Tier 1:

- Information and guidelines
- Condition Indicators for each type of equipment
- Scored using routine tests and inspections
- Results in Condition Index on scale of 1-10; higher is better
- Mid- to low-range values may trigger Tier 2 evaluation

Condition Assessments (cont.)

Tier 2:

- In-depth, non-routine tests or inspections
- Invasive and/or require specialized equipment and expertise
- Adjust Condition Index up or down
- Add confidence to results and conclusions

Example: Turbine Assessment

Tier 1:

Condition Indicator	***Score***
Age	0 – 3.0
Physical Condition	0 – 4.0
Operating Restrictions	0 – 1.5
Maintenance History	0 – 1.5
Turbine Condition Index	0 – 10.0
Data Quality Indicator	0, 4, 7, or 10

Example: Turbine Assessment (cont.)

Tier 2:

Efficiency	+/- 1.0
Capacity	+/- 0.5
Surface Roughness	+/- 0.5
Cracking	+/- 1.0
Cavitation	+/- 0.5
Environmental Improvements	+/- 0.5
Off-Design Conditions	+/- 0.5
Total Adjustment to Condition Index	+/- x.x

Condition-Based Alternatives

Condition Index	***Suggested Action***
$\geq$ 7.0 and $\leq$ 10 (Good)	Continue O&M without restriction.
$\geq$ 3.0 and < 7.0 (Fair)	Continue operation but reevaluate O&M practices. Consider Tier 2 tests.
$\geq$ 0 and < 3.0 (Poor)	Immediate evaluation including Tier 2 testing. Consultation with experts. Adjust O&M as prudent.

Example: Generator Assessment

Tier 1: (Stator and field windings)

- Insulation resistance and PI
- O&M history
- Physical inspection
- Age

Tier 2: (Stator, Rotor, Core)

- DC ramp
- High-pot
- Partial discharge
- Power factor
- Ozone
- Blackout
- Rated flux (loop)
- EL CID
- Wedge tightness
- Pole drop

Example: Transformer Assessment

Tier 1:

- Oil analysis
- Doble tests
- O&M history
- Age

Tier 2:

- Turns ratio
- Short circuit impedance
- Core ground
- Winding resistance
- Vibration analysis
- Frequency response
- Internal inspection
- Polymerization

Available Guides

Power train and auxiliary systems:

- Turbines
- Generators
- Transformers
- Circuit Breakers
- Governors
- Exciters
- Surge Arresters
- Emergency Closure Gates & Valves
- Cranes
- Compressed Air Systems
- Station Batteries

Building the Business Case

- Allocations based on condition, risk, economics, other factors
- Component, unit, and plant summaries
- Open and flexible analysis tools
- Fit into existing maintenance, planning, budgeting, and decision-making processes

Building the Business Case (cont.)

Analyses may vary in complexity:

- **Simple:** Condition/Trend → Decision

  Example – Failing compressor

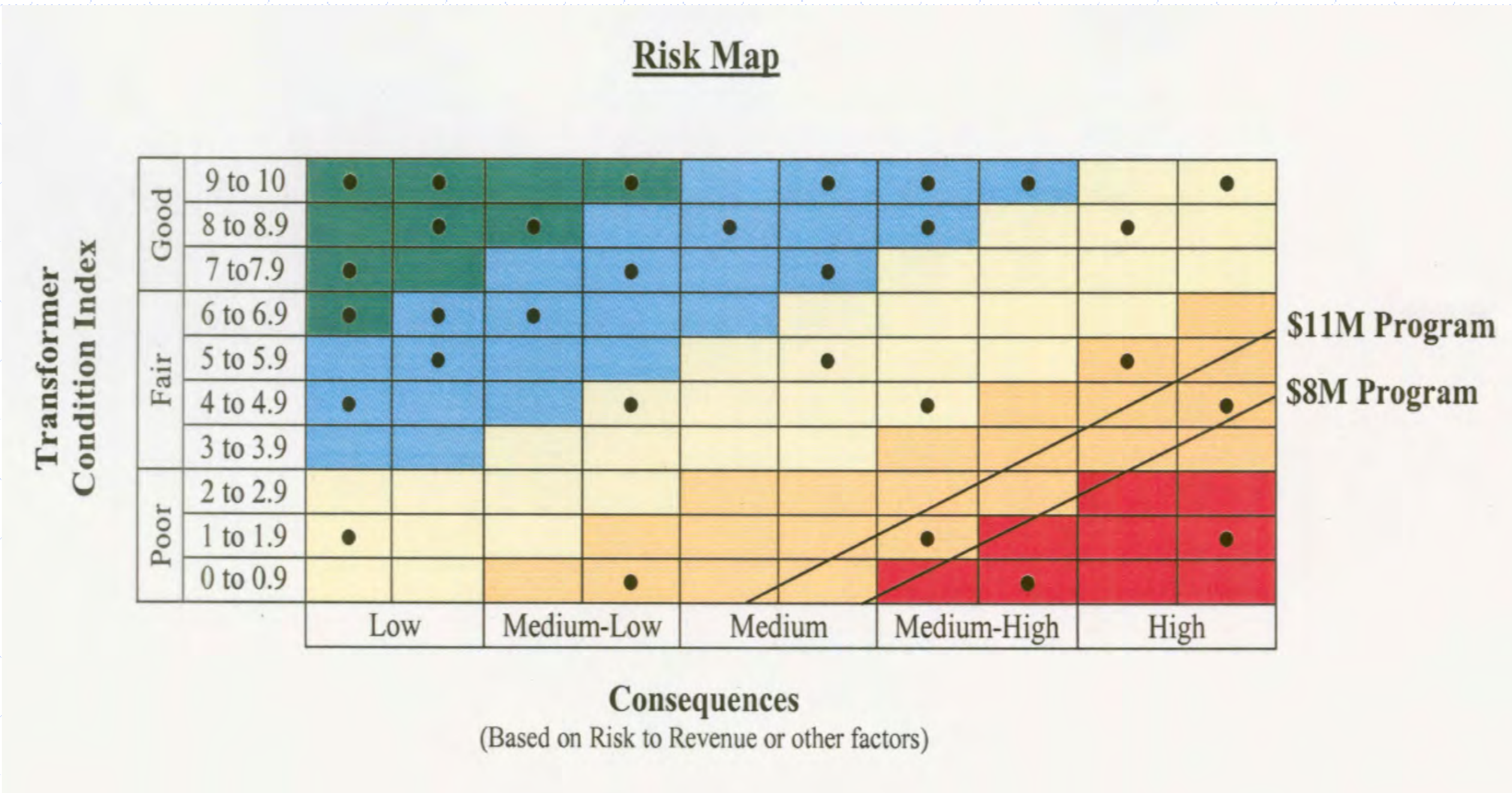
- **Comparative:** Condition/Trend → Value → Decision

  Example – Crane repair

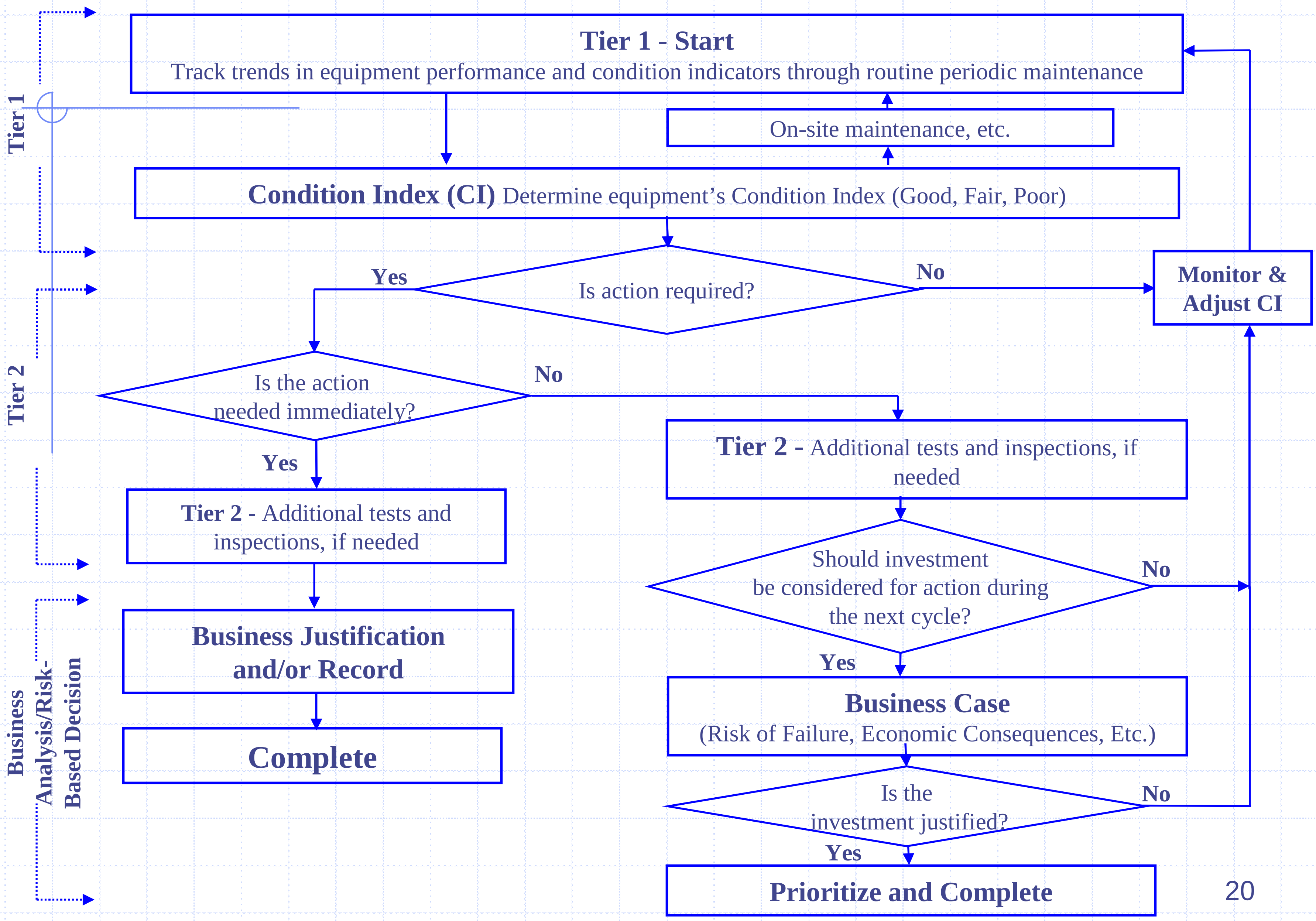
- **In-Depth:** Condition/Trend → Value → Risk and Economics → Decision

  Example – Generator uprate

Example: Influence Diagram (Risk Map) for a Population of Transformers



Overall Process



Intended Users

- O&M Field Staff
- Technical Support Staff & HDC
- Plant Managers
- District & Division Management
- Investment Decision-Makers

Current Status

COE – Within FCRPS:

- Transformer spare study (FY04)
- Tier 1 on all generators (FY05)
- Completing Tier 1 of turbines, governors, exciters, and circuit breakers.
    - PI goal is 95% completion of power train in FY05

Current Status

COE – Outside FCRPS:

- Planning pilot tests
- Using HydroAMP nationally to meet PART
- Nationwide transformer assessments in FY05 and FY06 (USACE-funded)

Current Status (cont.)

BPA & COE:

- Excel spreadsheet for FCRPS assessment data
  - Calculates unit and plant condition summaries
- Developing web-based application
  - Improved data collection, tracking, reporting
  - Accommodate all Corps plants

What's Next?

- Complete asset management tools
  - Equipment assessment guides
  - Guidebook
- Implement nationwide
  - On-site training/orientation outside of FCRPS
  - Make tools available
- Evaluate and improve
  - Assess, update, clarify

What's Next? (cont.)

- USACE Workshop on Asset Management (August '05)
  - Describe HydroAMP program
  - Relate to other CW business lines
- Special panel session planned for *HydroVision 2006* (with HydroAMP partners).

Conclusions

HydroAMP supports

- Repair, replacement, monitoring
- Comparisons and prioritization
- Budget coordination at multiple levels
- Long-term investment strategies
- Performance goals

End of Presentation

Questions?

Effective Use Of Evaporative Cooling For Industrial And Institutional/Office Facilities

Presented By:

Leon E. Shapiro

The Green Building Group

Bloomingdale, IL

NDIA

2005 Tri-Service Infrastructure Systems Conference

St. Louis, MO

August 3, 2005

What Does It Take To Get You To Do That Which You Ought To Do?

- The fact is, there are really only two reasons why people make changes in the way they do things:
  - They are ***forced*** to change
  - It costs/hurts more ***not*** to change than to change

External Forces Affect The Way You Design/Operate Your Facilities

- Executive Order 13123
- ASHRAE Standard 62 .1- 2004
- ASHRAE Standard 90.1 - 2004
- LEED™ Certification and Green Building
- Indoor Air/Environmental Quality Concerns
- Escalating Energy Costs
- Chemical/Biological Warfare
- Global Climate Change Treaty

High Performance HVAC Benefits

- Innovative engineering and design can:
  - Improve system performance
  - Reduce first costs
  - Reduce operating costs
  - Reduce energy use
  - Reduce life cycle costs
  - Improve IAQ and IEQ
  - Minimize CBW concerns

What Is A "High Performance" HVAC System?

- Combines energy efficiency and indoor environmental quality
- Energy efficiency
  - Minimizes use of virgin/raw energy sources
- Indoor environmental quality (IEQ)
  - Optimizes indoor air quality (IAQ)
  - Provides stable thermal comfort
- New construction offers greater opportunities, but retrofits of existing buildings can be easily achieved to provide significant benefits for both the owner/operator and the occupants

IEQ/IAQ
Why Are They More Important Than Ever?

- Findings from many studies indicate that:
  - Many health problems are linked to poor IAQ
  - Inadequate ventilation is a major cause
  - Mold, germs and contaminants spread by mechanical recirculation systems are a major cause
  - Poor humidity control is a contributing factor
  - Poor building pressurization is a contributing factor
  - Improved IEQ/IAQ results in:
    - lower absentee rates
    - reduced worker turnover
    - increased productivity

Is There A Conflict Between Energy Efficiency And IEQ/IAQ?

- NO!
- High performance hybrid HVAC equipment and designs can eliminate the outdoor air penalty and thus eliminate any potential conflict between energy efficiency and indoor air quality.

High Performance Hybrid HVAC
Some Design Strategies

- Dual Path Ventilation
  - Separate ventilation from heating /cooling
  - Eliminate terminal reheat
- Energy Recovery
  - Recycle cooling/heating energy
  - Reduce the use of new energy resources
- Displacement Ventilation
  - Permits smaller 100% OSA systems
  - Increased ventilation effectiveness
  - Reduces energy use

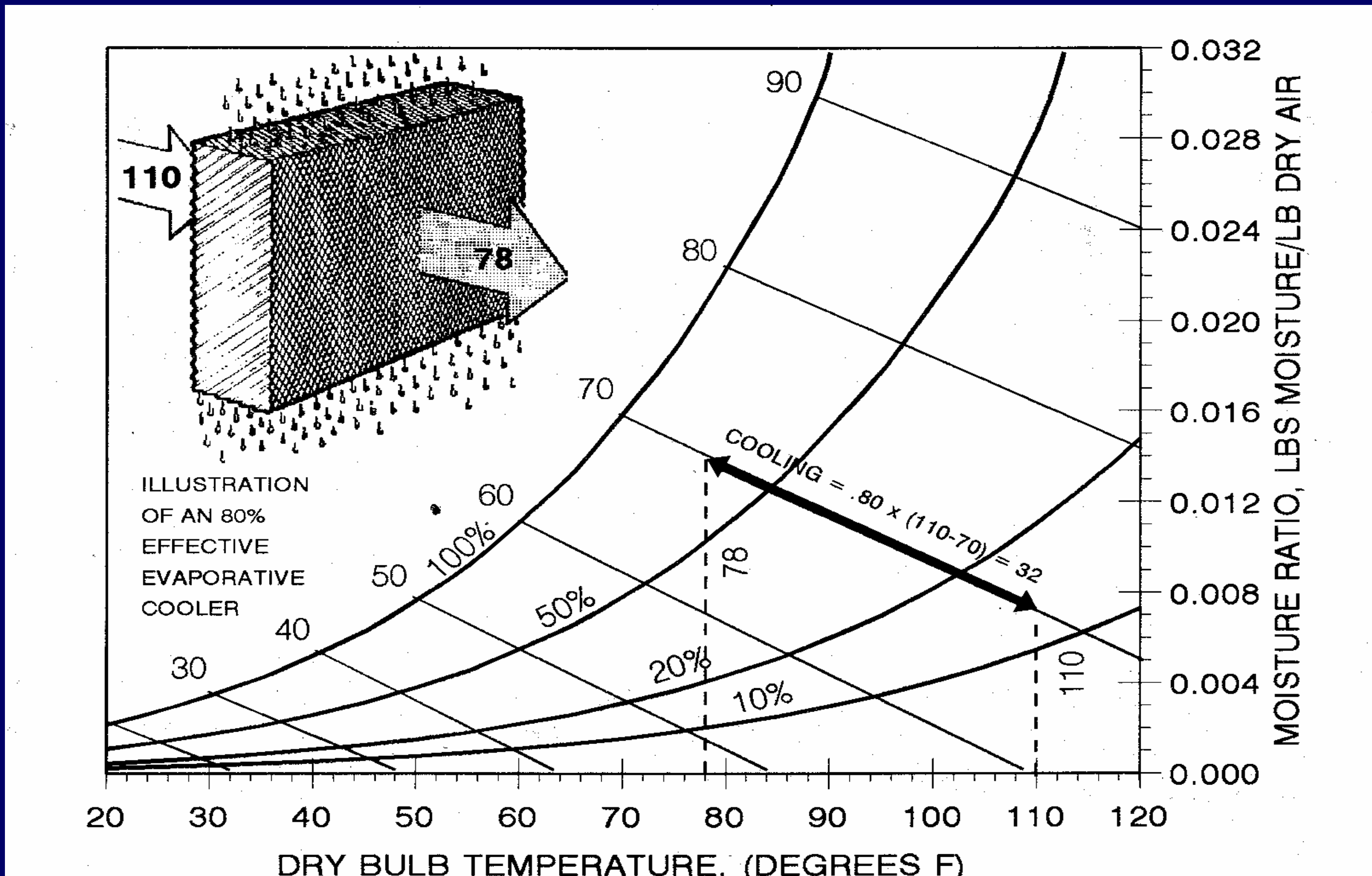
...More Design Strategies

- Process Synergy
- Multi-Functional Use
  - Use individual components for multiple tasks
  - Reduces parasitic losses
- Evaporative Cooling
  - Reduces (or eliminates) mechanical cooling ***and*** heating plants
  - Provides low cost humidification
- Thermal Storage
  - Reduces mechanical cooling plant
  - Reduces energy costs

Evaporative Cooling
A Very Powerful Tool

- Evaporative cooling technologies form the backbone of energy efficient high performance hybrid HVAC systems
- There are **2** forms of evaporative cooling
  - **Direct**
    - Draws warm air through a wetted media
  - **Indirect**
    - Utilizes an air-to-air plate heat exchanger to separate the supply air from the water used for evaporation
    - Uses a secondary air stream to reject heat from the evaporation process

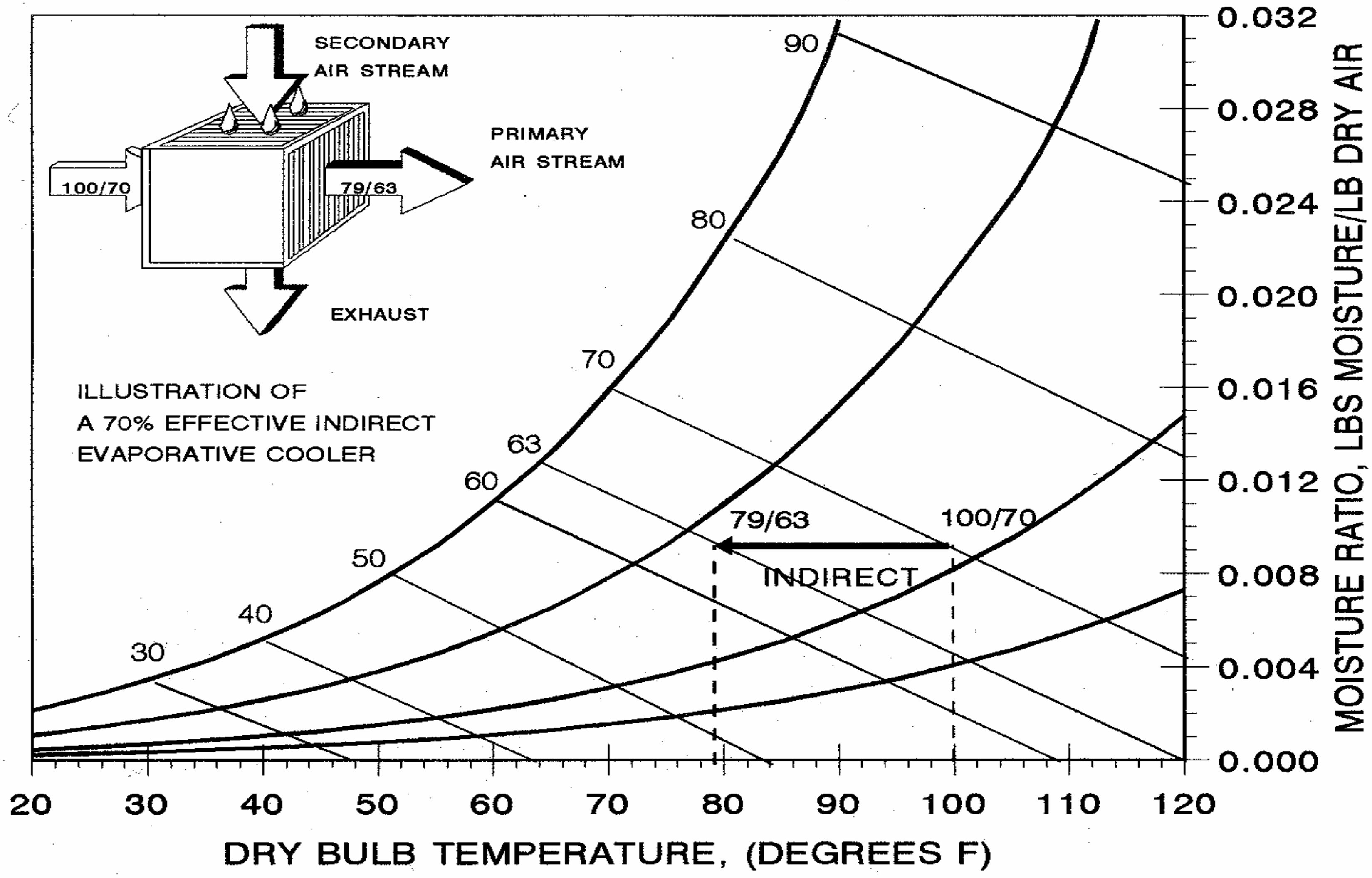
Direct Evaporative Cooling



Direct Evaporative Cooling

- ***Effectiveness*** is defined by the following equation:
  - * $\mathbf{E = (TI_{db} - TD_{db}) \div (TI_{db} - TI_{wb})}$
- ***Discharge Temperature*** can be determined by the following equation:
  - * $\mathbf{TD_{db} = TI_{db} - [E \times (TI_{db} - TI_{wb})]}$
- Factors affecting effectiveness are:
  - * type of media
  - * depth of media
  - * face velocity

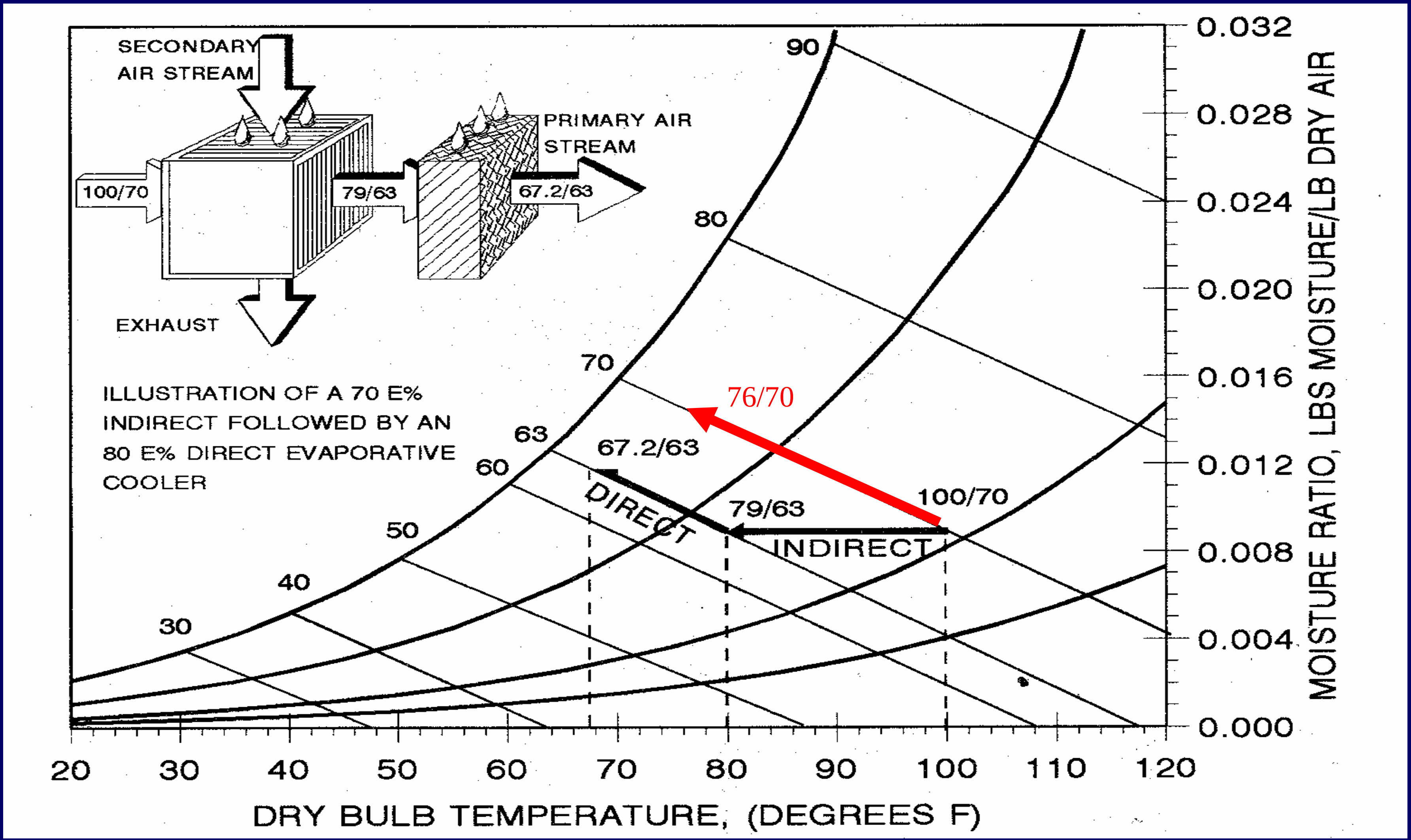
Indirect Evaporative Cooling



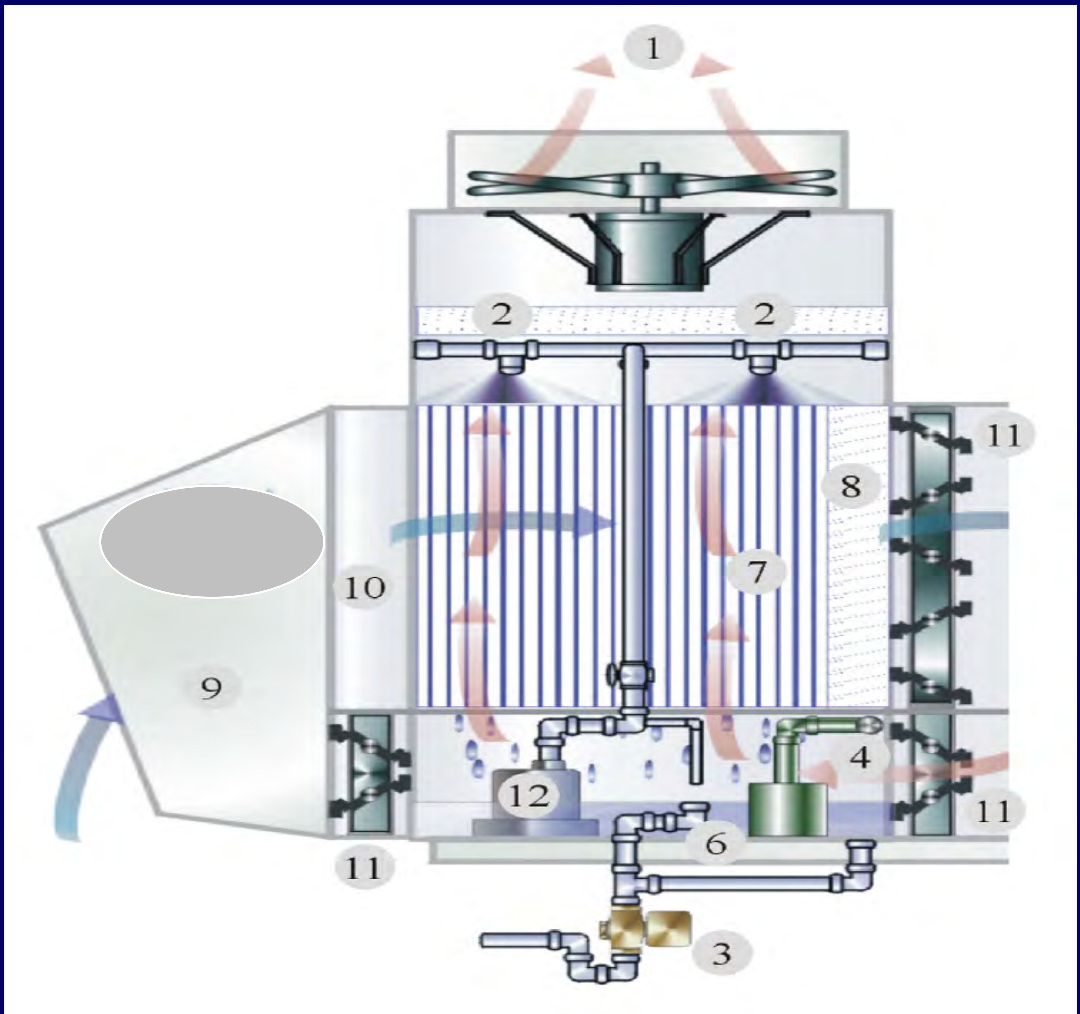
Indirect Evaporative Cooling

- ***Effectiveness*** is defined by the following equation:
    - * $\mathbf{E = (TI_{db} - TD_{db}) \div (TI_{db} - TIS_{wb})}$
- ***Discharge Temperature*** can be determined by the following equation:
    - * $\mathbf{TD_{db} = TI_{db} - [E \times (TI_{db} - TIS_{wb})]}$
- Factors affecting effectiveness are:
    - * type of heat exchanger
    - * supply and secondary air mass flow ratios
    - * use of outside air vs. building exhaust as the secondary/scavenger air source

Indirect/Direct (Two-Stage) Evaporative Cooling



Typical Indirect Module



1) SECONDARY FAN

2) NOZZLE SPRAY HEADER

3) DRAIN SOLENOID

4) SUPPLY WATER VALVE

6) OVERFLOW DRAIN

7) INDIRECT HEAT EXCHANGER

8) DIRECT SECTION (Optional)

9) INLET HOOD (Optional)

10) INLET FILTER (Optional)

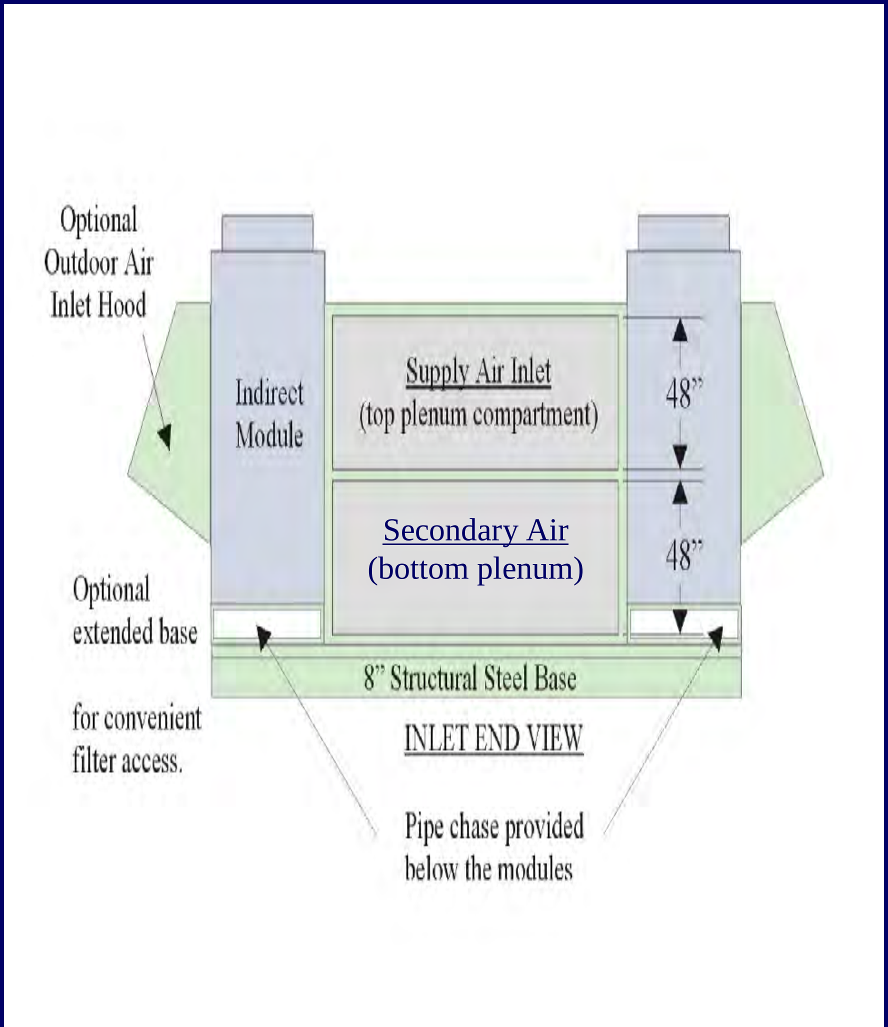
11) CONTROL DAMPERS (Optional - used to allow either building exhaust or outdoor air to be used as secondary air)

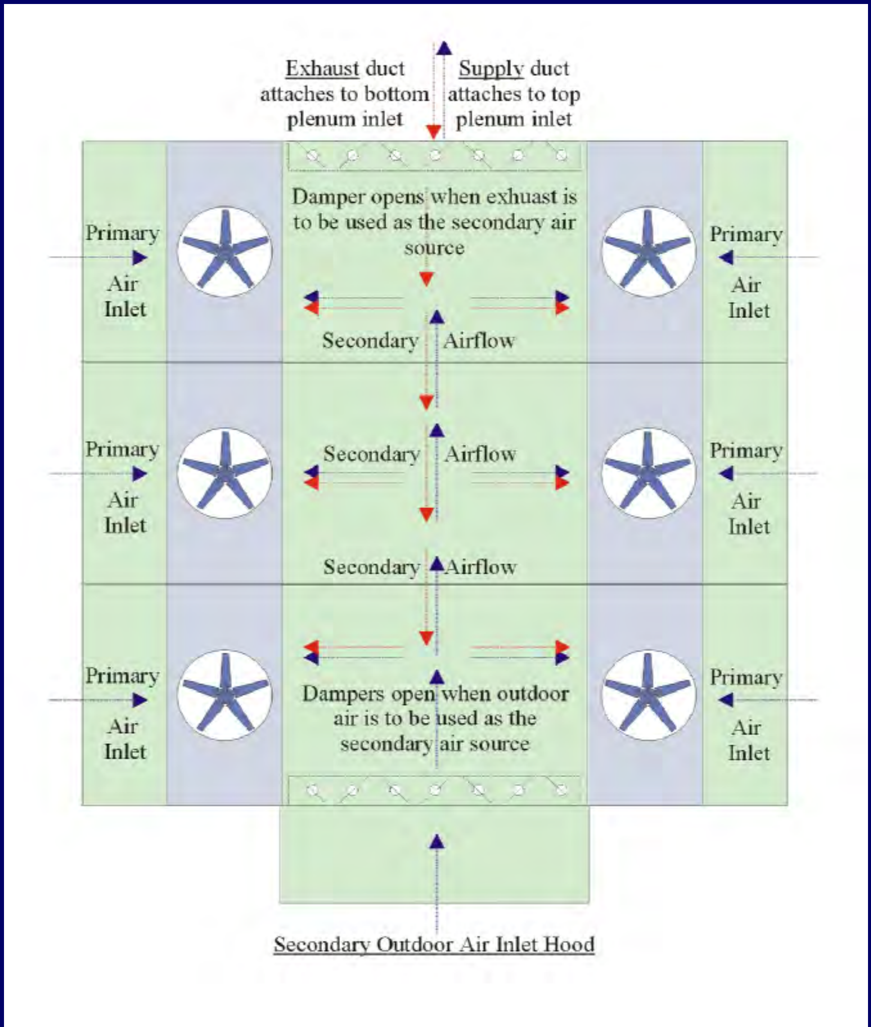
12) RECIRCULATING PUMP

Typical Indirect Module

1,000 - 15,000 CFM

Multiple Indirect Modules





Up To 90,000 CFM

Multi-Module Unit

45,000 CFM Unit

Evaporative Cooling Performance

- Low Wet Bulb Climate
  - OSA 97/68
  - Direct 71/68
  - Indirect (OSA) 75/61
  - Indirect/Direct 62/61
  - Indirect (BESA) 72/60

- High Wet Bulb Climate
  - OSA 97/76
  - Direct 78/76
  - Indirect (OSA) 81/71
  - Indirect/Direct 72/71
  - Indirect (BESA) 72/69

Performance Chart (Low Wet Bulb Area)

SACRAMENTO, CALIFORNIA

Performance of Evaporative Cooling and Heat Recovery Technologies

Ambient OSA DB/WB	Hours/ Year	DIRECT	INDIRECT OSA as Secondary Air	INDIRECT Bldg. Exhaust as Secondary Air	INDIRECT /DIRECT OSA as Secondary Air
107/70 (34.1)	7	74/70	79/61 (27.2)	74/59 (25.9)	63/61
102/70 (43.1)	59	73/70	78/63 (28.7)	73/61 (27.2)	65/63
97/68 (32.5)	144	71/68	75/61 (27.2)	72/60 (26.5)	62/61
92/66 (30.9)	242	69/66	72/60 (26.5)	70/59 (25.9)	61/60
87/65 (30.1)	301	67/65	70/59 (25.9)	69/59 (25.9)	60/59
82/63 (27.3)	397	65/63	68/58 (25.2)	68/58 (25.2)	59/58
77/61 (27.2)	497	63/61	65/57 (24.7)		58/57
72/59 (25.9)	641	60/59	62/55 (23.4)		56/55
67/57 (24.7)	821	58/57	60/54 (22.7)		55/54
62/54 (22.7)	1086	55/54	56/52 (21.5)		53/52

The above discharge temperatures (°F) are based on the following:

1. 75% Indirect Evaporative Effectiveness
2. 90% Direct Evaporative Effectiveness
3. 60% Heat Recovery Effectiveness
4. 75°F Building Exhaust Dry Bulb Temperature (Heat Recovery)
5. 63°F Building Exhaust Wet Bulb Temperature (Cooling)
6. DB = Dry Bulb Temperature
7. WB = Wet Bulb Temperature
8. OSA = Outside Air
9. ( ) Indicates Enthalpy Of Air

Performance Chart (High Wet Bulb Area)

CHICAGO, ILLINOIS

Performance of Evaporative Cooling and Heat Recovery Technologies

Ambient OSA DB/WB	Hours/ Year	DIRECT	INDIRECT OSA as Secondary Air	INDIRECT Bldg. Exhaust as Secondary Air	INDIRECT /DIRECT OSA as Secondary Air	HEAT RECOVERY
97/76 (39.5)	6	78/76	81/71 (35.0)	71/69 (33.3)	72/71	
92/74 (37.7)	58	76/74	78/70 (34.1)	70/68 (32.5)	71/70	
87/72 (35.9)	165	73/72	76/69 (33.3)	69/67 (31.7)	70/69	
82/70 (34.1)	324	71/70	73/67 (31.7)	68/66 (30.9)	68/67	
77/67 (31.7)	487	68/67	70/65 (30.1)	67/64 (29.4)	66/65	
72/64 (29.5)	681	65/64	66/62 (27.9)	65/6227.9)	63/62	
67/61 (27.2)	759	62/61	63/59 (25.9)	64/60 (26.5)	60/59	
62/57 (24.7)	700	58/57	60/56 (24.0)		57/56	
57/52 (21.5)	604	53/52	53/50 (20.3)		51/50	
52/47 (18.8)	581	48/47	48/45 17.7)		46/45	66
47/43	565					64
42/38	572					62
37/34	725					60
32/30	869					58
27/25	589					56
22/21	371					54
17/16	231					52
12/11	164					50
7/6	115					48
2/1	89					46
-3	53					44
-8	27					42
-13	11					40
-17	2					38

Performance Chart (Very High Wet Bulb Area)

BATON ROUGE, LOUISIANA

Performance of Evaporative Cooling and Heat Recovery Technologies

Ambient OSA DB/WB	Hours/ Year	DIRECT	INDIRECT OSA as Secondary Air	INDIRECT Bldg. Exhaust as Secondary Air	INDIRECT /DIRECT OSA as Secondary Air	HEAT RECOVERY
97/78 (41.7)	13	80/78	83/74 (37.7)	72/71 (35.0)	75/74	
92/76 (39.5)	211	78/76	80/73 (36.8)	70/69 (33.3)	74/73	
87/75 (38.6)	464	76/75	78/72 (35.9)	69/69 (33.3)	73/72	
82/72 (35.9)	984	73/72	75/70 (34.1)	68/68 (32.5)	71/70	
77/70 (34.1)	1214	71/70	72/68 (32.5)	67/67 (31.7)	69/68	
72/67 (31.7)	1517	68/67	68/66 (30.9)	65/65 (30.1)	66/65	
67/62 (27.9)	916	63/62	63/61 (27.3)		62/61	
62/58 (25.2)	878	59/58	59/57 (24.7)		58/57	
57/52 (21.5)	677	53/52	53/50 (20.3)		51/50	
52/47 (18.8)	601	48/47	48/45 (17.7)		46/45	66
47/43	543					64
42/39	296					62
37/34	249					60
32/30	171					58
27/25	22					56
22/23	4					54

Industrial Spaces

- Industrial facilities are particularly susceptible to problems related to heat and IAQ during extended periods of the year
  - Heat stress
  - Increased down time
  - Increased accidents and absenteeism
  - Quality control problems
  - Reduced productivity

What Are The Adverse Affects Of Heat?

NASA Report CR-1205-1 (Heat Stress)

Effective Temperature	75	80	85	90	95	100	105
Loss in Work Output	3%	8%	18%	29%	45%	62%	79%
Loss in Accuracy	-	5%	40%	300%	700%	-	-

So, What Is The Usual Solution?

- Use make-up air units to increase ventilation and make up for process exhaust (most of these units do not cool the outside air)
- Open up the doors and windows
- Bring out the floor fans

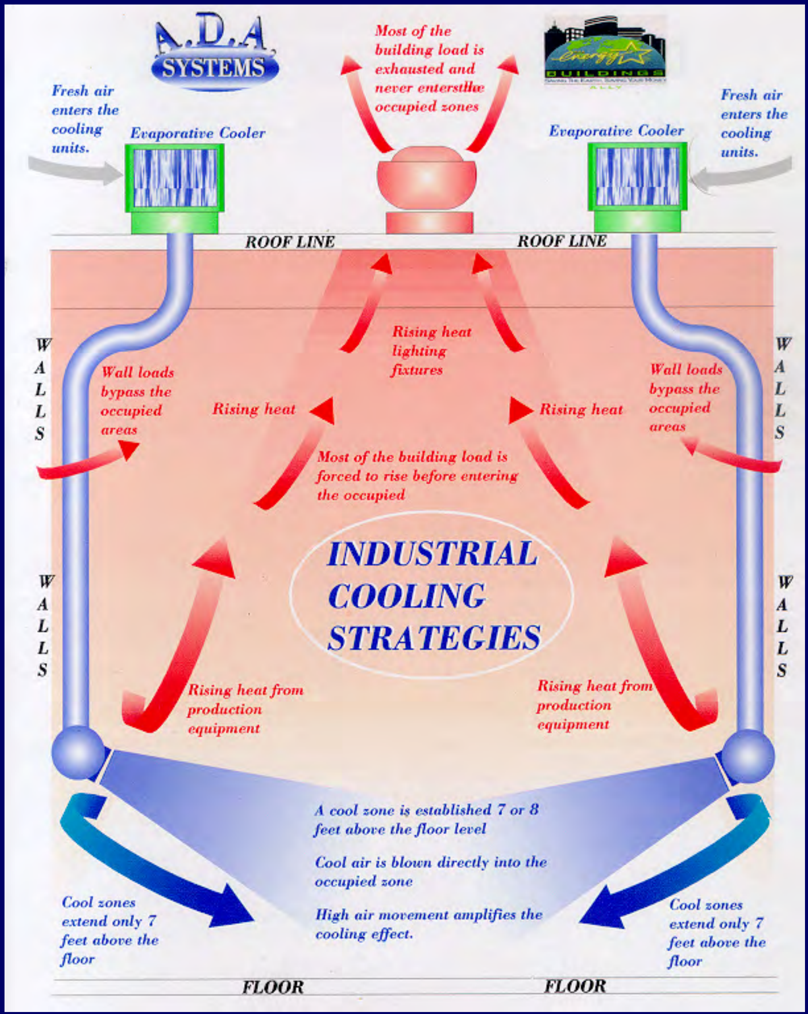
- This may help…but does not effectively address heat stress!

And, The Best Solution Is...

- ACGIH has established guidelines for reducing heat stress, including:
  - Increased rates of ventilation
  - **Evaporative cooling of ventilation air**
  - Displacement ventilation with stratification
  - Increased fluid intake

Industrial Cooling Strategies

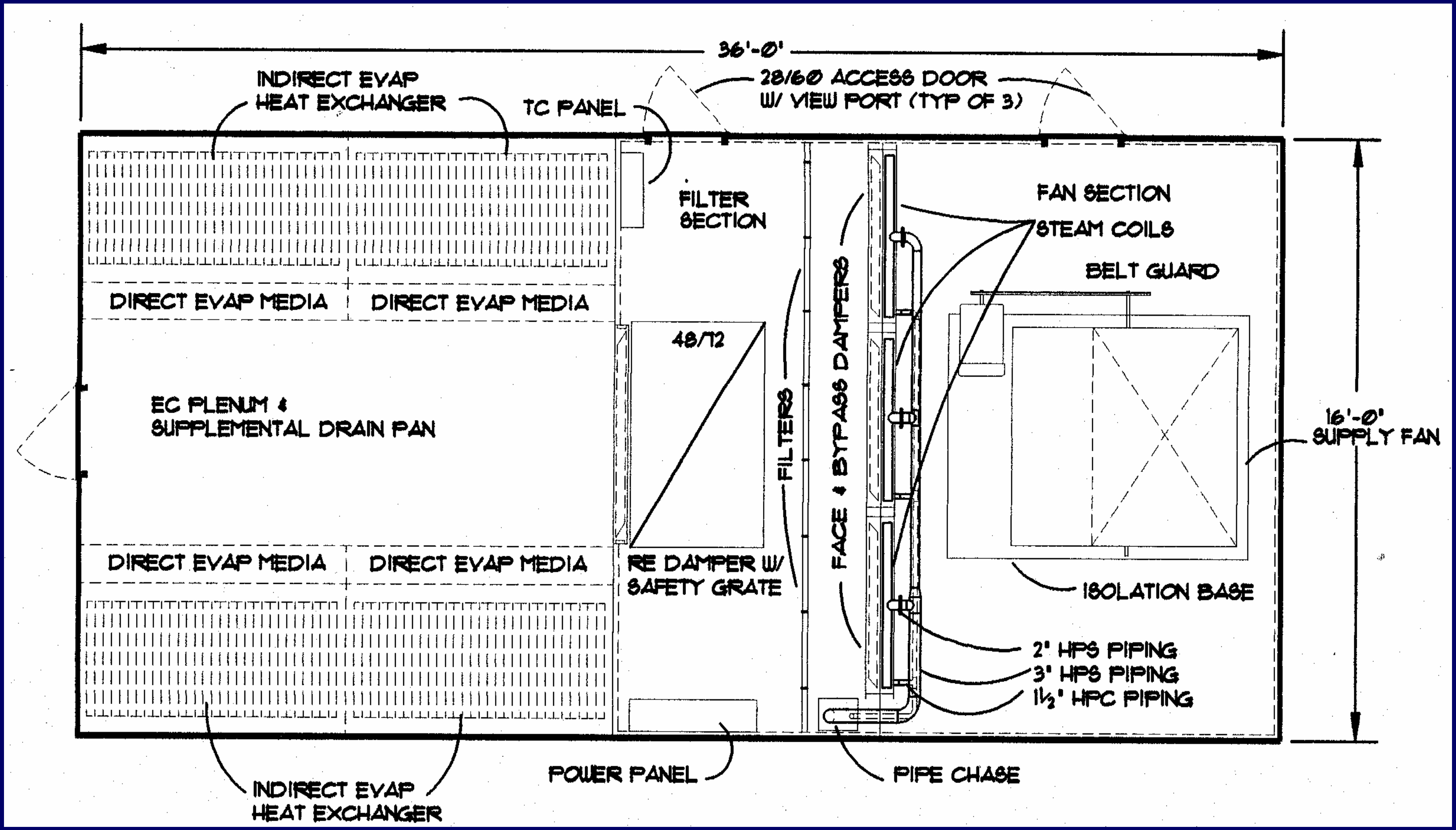
- Strategies to increase the effectiveness of evaporative cooling:
  - Displacement Ventilation
  - Stratification
  - Spot Cooling
  - Adjustable Diffusers



Industrial Cooling
Case Study 1

- CLIENT: Indianapolis Wood Veneer Manufacturer
- PROBLEM: Excessive Heat (>100^{o}F)
- GOAL: Low Cost Relief Cooling
- SOLUTION:
  - Indirect/Direct Evaporative Cooling
  - Eliminated The Proposed 1,800-Ton Chilled Water System
  - $2M vs $4.5M First Cost

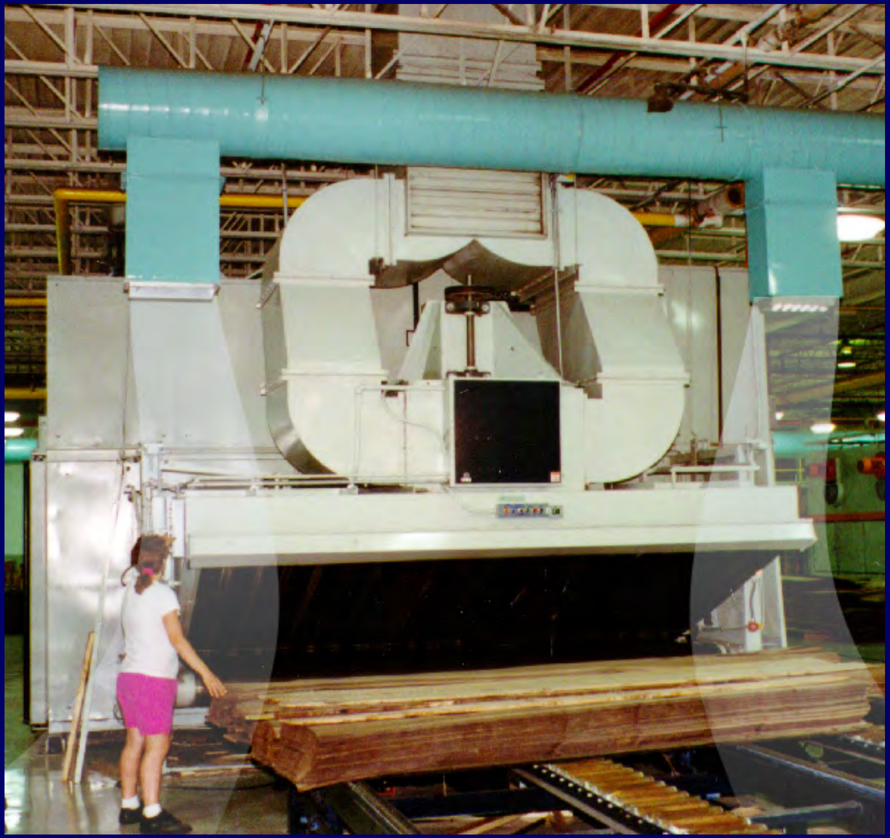
Industrial Cooling
Case Study 1



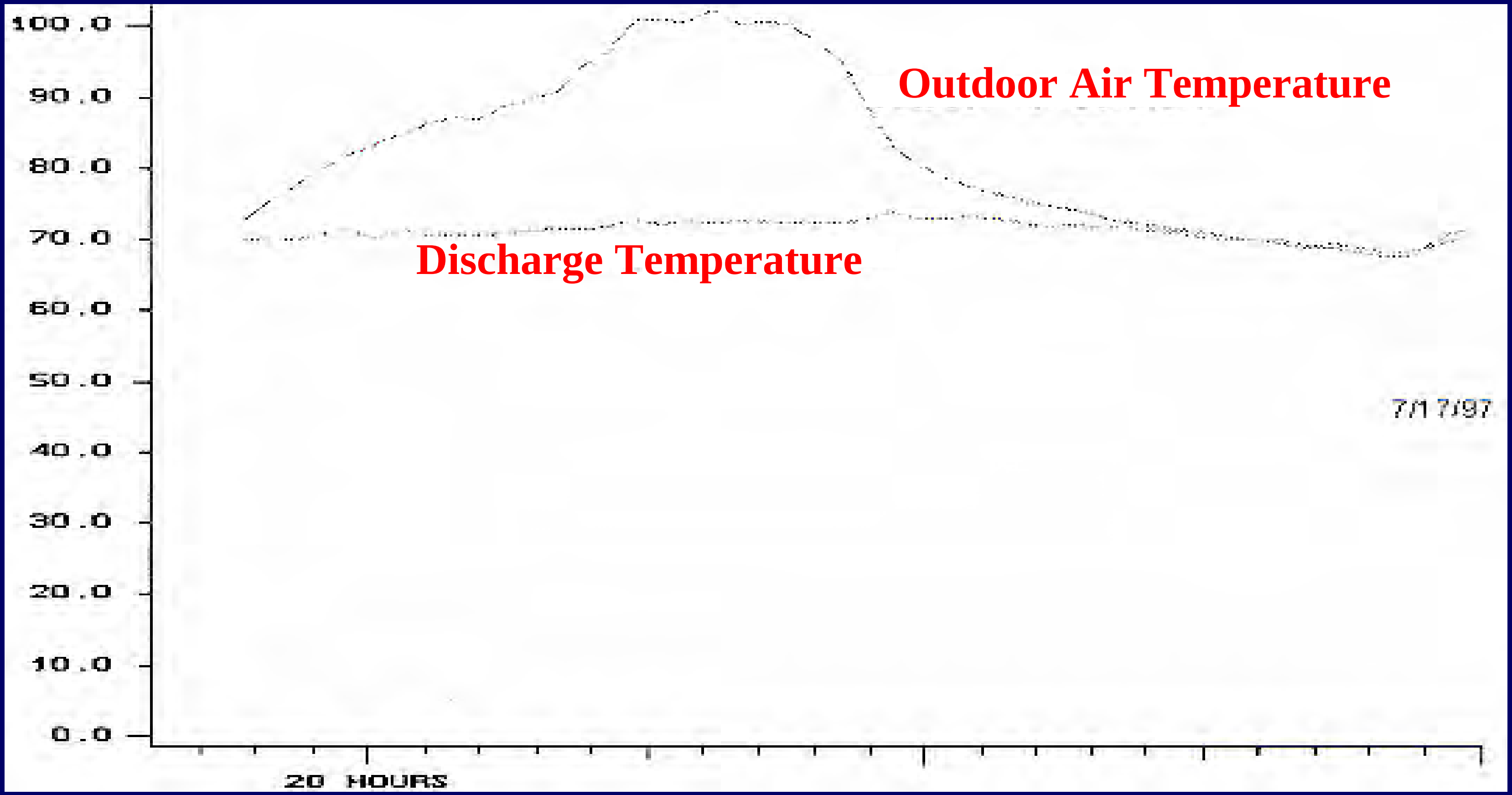
62,000 CFM Air Handler (1 of 4)

Industrial Cooling
Case Study 1

- Displacement Ventilation
- Spot Cooling
  - Establishes a cool zone
  - ***Feels*** like air conditioning
- Adjustable Diffusers



Industrial Cooling
Case Study 1



Field Temperature Recording

Industrial Cooling
Indirect With Chiller And Heat Recovery

- An Indirect evaporative pre-cooler can be used to reduce the size of a new chilled water system, or can be used to reduce the outside air load on an existing system.
- When used for energy (heat) recovery in winter operations, that same indirect unit can pre-heat the outside air.

Industrial Cooling
Case Study 2

- CLIENT: Chicago Printing Company
- PROBLEM: Undercapacity Chilled Water Plant
- GOAL: Avoid Increasing Chiller Plant
- SOLUTION:
  - Indirect Evaporative Pre-Cooler
  - Avoided Doubling The Chilled Water Plant Size
  - Desired Space Conditions Regained

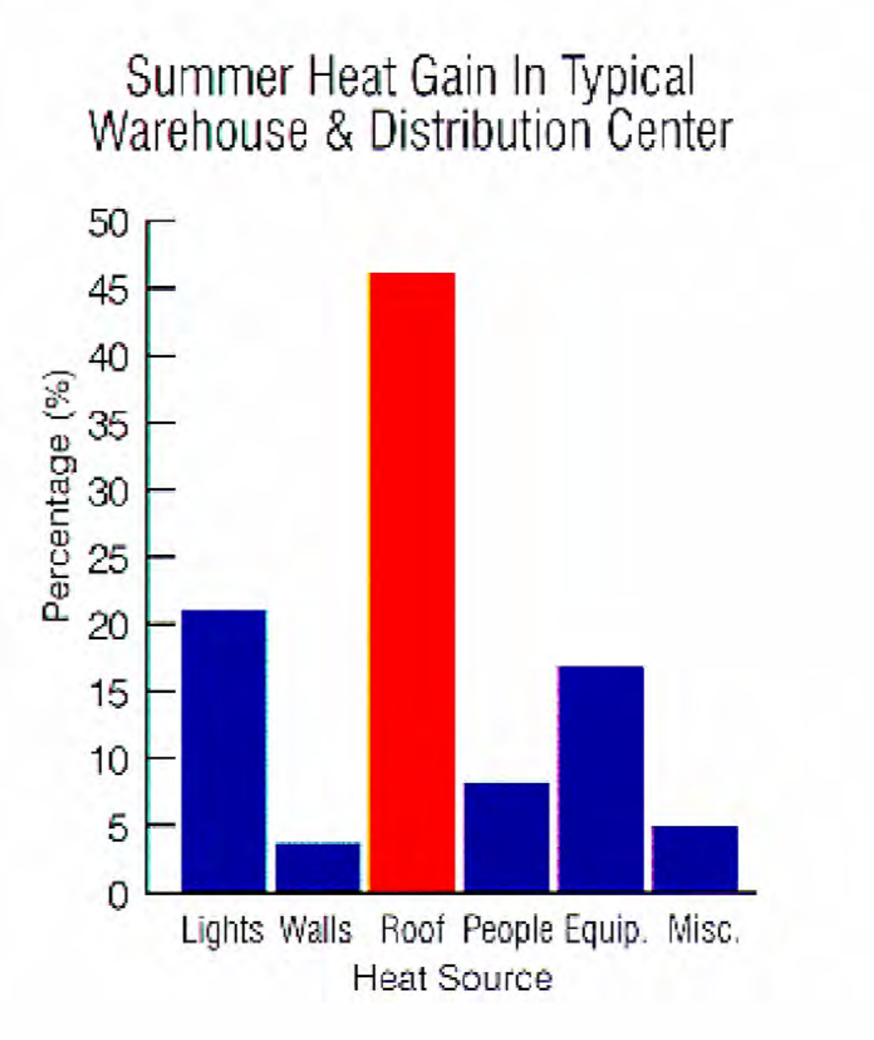
Industrial Cooling
Case Study 2

Before: 18,000 CFM OSA Intake

After: 18,000 CFM Indirect Evaporative Pre-Cooler

Industrial Cooling: Roof Misting

- Roof load heat gains are substantial
- Internal heat gains rise dramatically
- **Roof Misting** can drop the roof temperature up to 50ºF
- Every 1.5 gallons of water that is evaporated absorbs more than 12,000 BTUs (a **ton** of cooling)



Industrial Cooling: Roof Misting

- **Roof Misting** can virtually eliminate the roof load
- Non-air conditioned buildings can lower space conditions **8ºF to 12ºF**
- Air conditioned buildings will reduce the load on the roof-top units and increase their performance
- Can extend the roof life by up to 50%

Institutional/Office Applications High Performance Hybrid HVAC

- The **Regenerative Double Duct™** is a hybrid, multi-component/function design that is proving to be one of the most energy efficient HVAC systems available. Its major components are:
  - **Indirect Evaporative Cooler (IDEC)**
    - First stage cooling
    - First stage heating
    - Limited capacity to act as a cooling tower
  - **Direct Evaporative Cooler (DEC)**
    - Direct evaporative cooling (when conditions permit)
    - Air filtration/scrubbing
    - Humidification

High Performance Hybrid HVAC

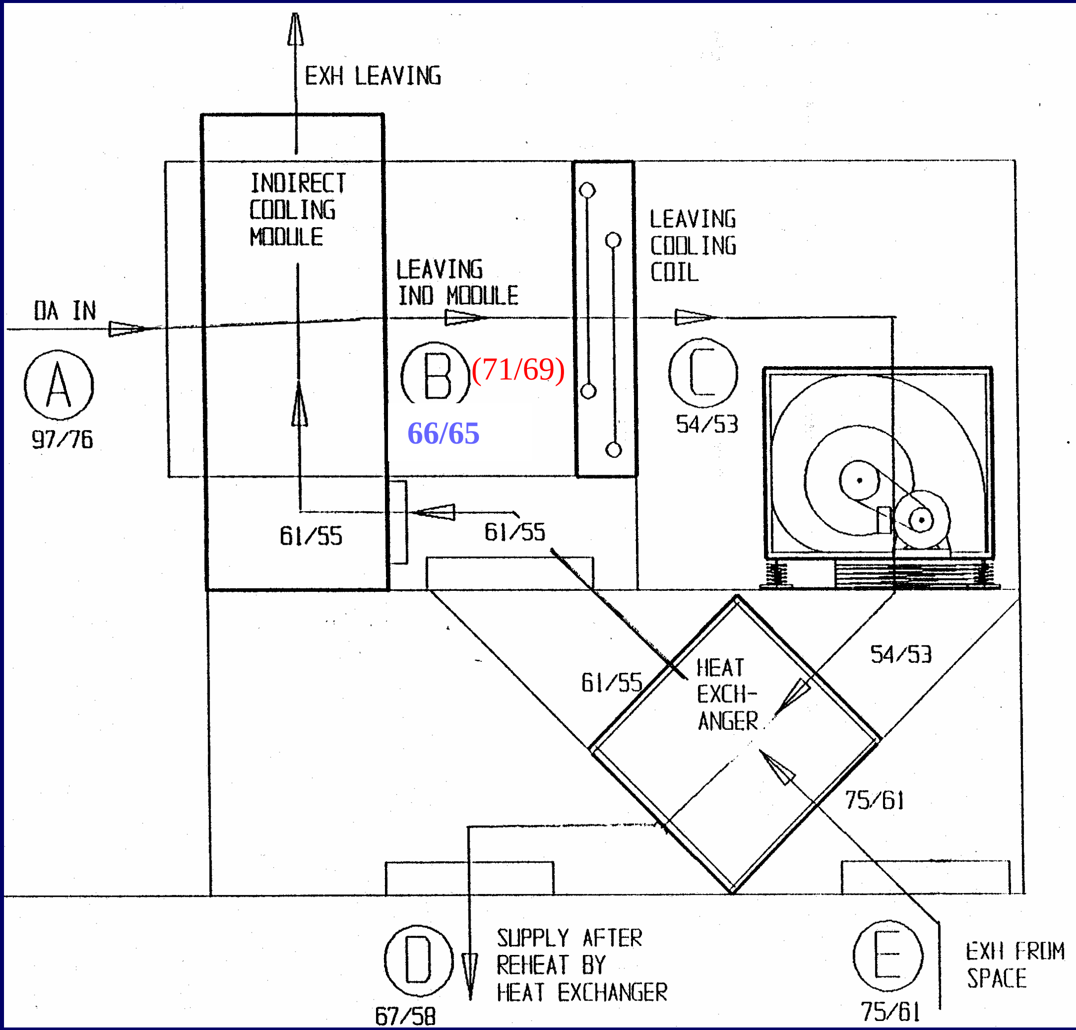
- **Secondary Plate-And-Frame Heat Exchanger (HX)**
  - Provides heating for the hot deck
  - Sub-cools building exhaust
- **Thermal Energy Storage**
  - Makes ice during less expensive time of day
  - Flattens out the demand curve
  - Downsizes the chilled water plant
- **Chilled Water**
  - Supplemental cooling
  - Supplemental dehumidification
- **Boilers**
  - Perimeter heating
  - Supplemental heating

High Performance Hybrid HVAC

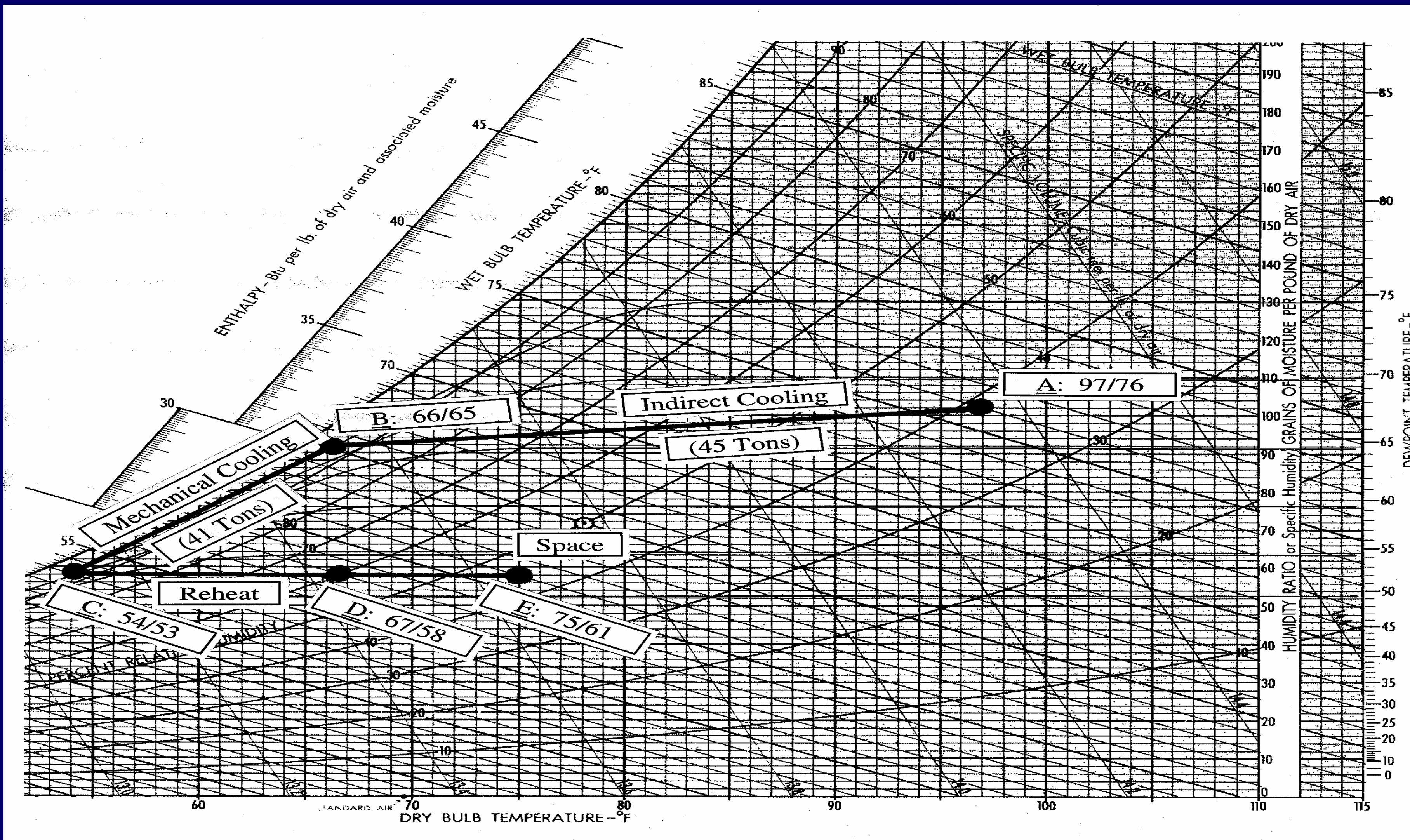
- **Heating Coil**
  - Pre-heat (on building exhaust)
  - Supplemental heat
  - Defrost (for IDEC)
- **Filtration**
  - Supply
  - Exhaust
- **Water Treatment**
  - Ozonation
  - Mechanical (non-chemical)
  - Filtration
- **Building Automation System (Controls)**

High Performance HVAC
Low Energy Reheat

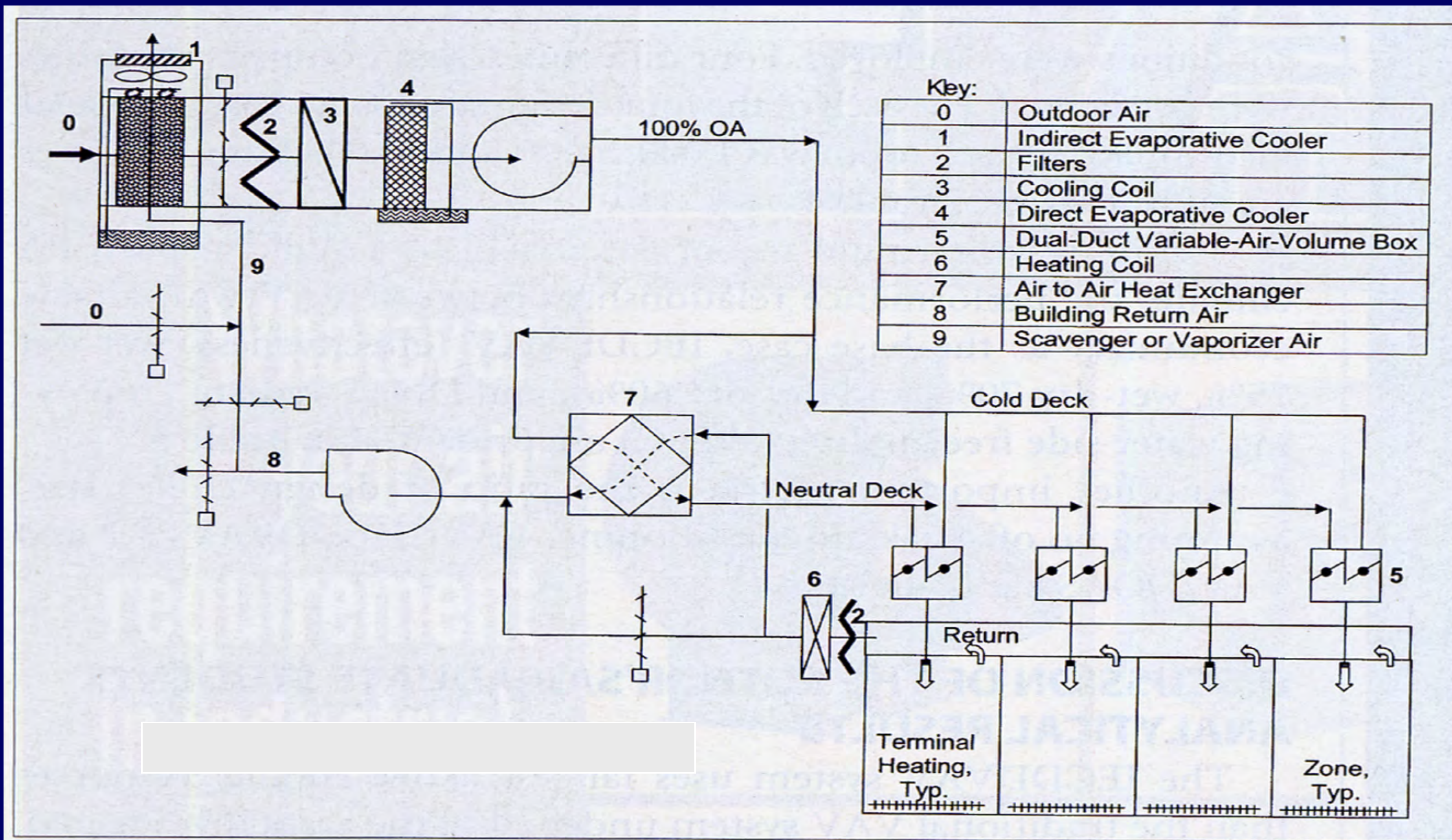
- Facilities with high OSA needs often require expensive reheat
- Components of a low energy reheat system:
  - Indirect evaporative pre-cooler
  - Mechanical cooling coil
  - Secondary heat exchanger



High Performance HVAC
Low Energy Reheat



High Performance Hybrid HVAC System Schematic

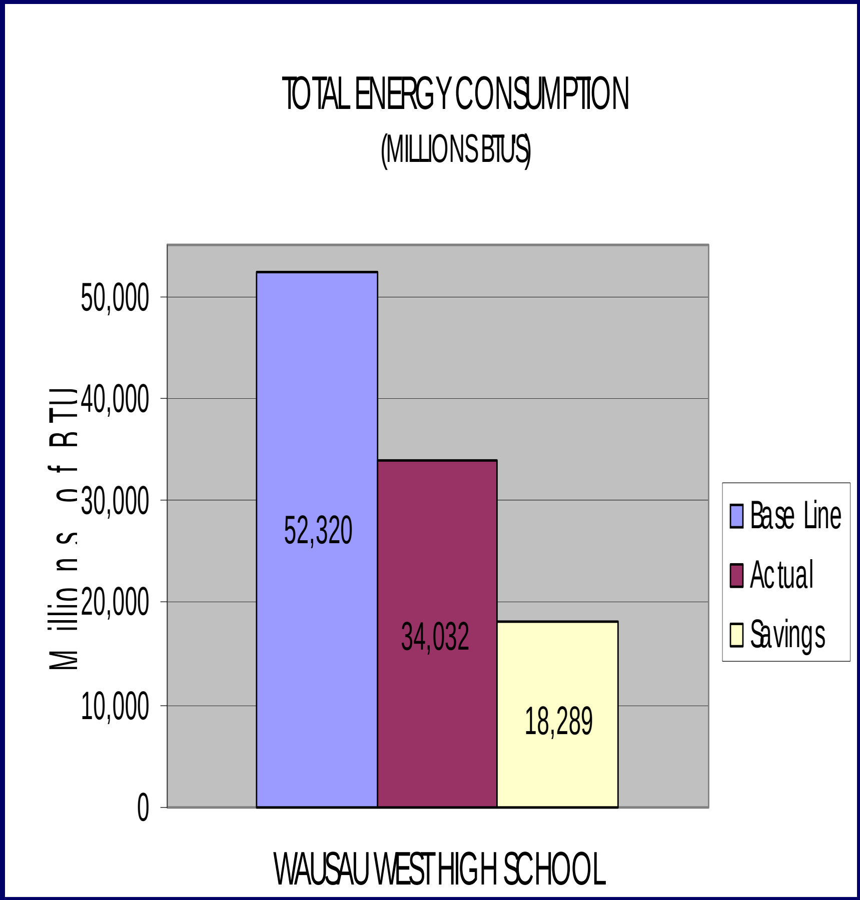


High Performance Hybrid HVAC
Case Study 1

- Wausau West High School Wausau, WI
- Problems they were facing:
  - Expensive retrofit of existing chiller and boiler plants
  - Severe indoor air quality problems
  - Non-compliance with Standard 62
  - Rising energy costs

Eliminate The "Energy Penalty" For 100% OSA

- "Base Line" energy consumption based on the former HVAC system that utilized **minimum outside air** and recirculated a majority of existing building air
- "Actual" energy consumption based on the new **100% outside air** HVAC system

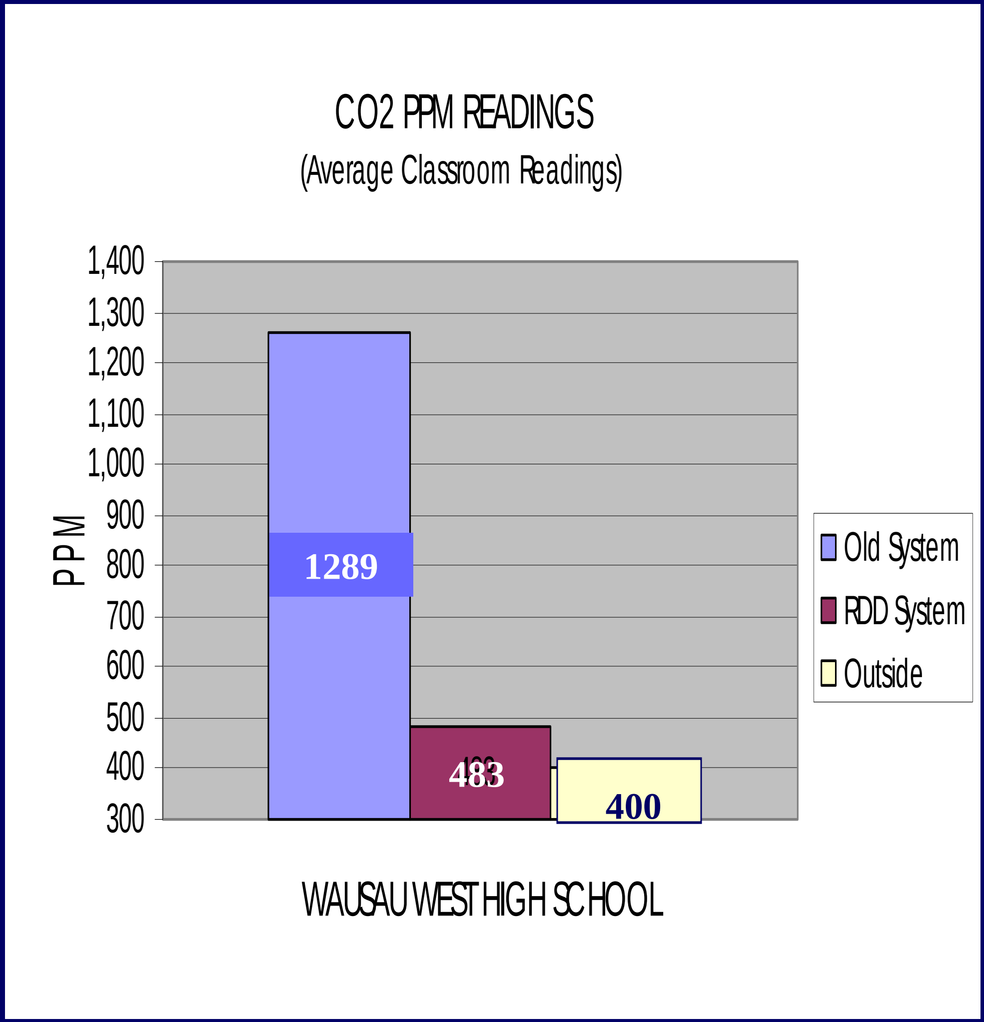


29.3% Energy Cost Reduction

Good Things Happen When Bad Things Are Not Recirculated

- ASHRAE Standard 62.1-2004 uses an indoor to outdoor differential concentration not greater than 700 ppm of CO_2 as an indicator of acceptable indoor air quality
- Classroom CO_2 reduced by **<u>262%</u>**

- **What are the implications for CBW defensive HVAC designs?**



Wausau West High School Retrofit Profile

- 275,000 S/F
- 100% OSA (No Recirculation When Occupied)
- 100% Air Conditioned
- 70 Tons (Nominal) Chilled Water Plant
  - **91% Reduction From Proposed Retrofit**
- 7 MMBH Boiler Plant (100% Redundancy)
  - **60% Reduction From Old Boiler Plant**
- Total Building Energy Cost:
  - **29.3% Reduction**

Wausau West High School

IDEC Units

Wausau West High School

70-Ton Chiller

7MMBH Boiler Plant

Wausau West High School

DEC Unit

Ozone Water Treatment

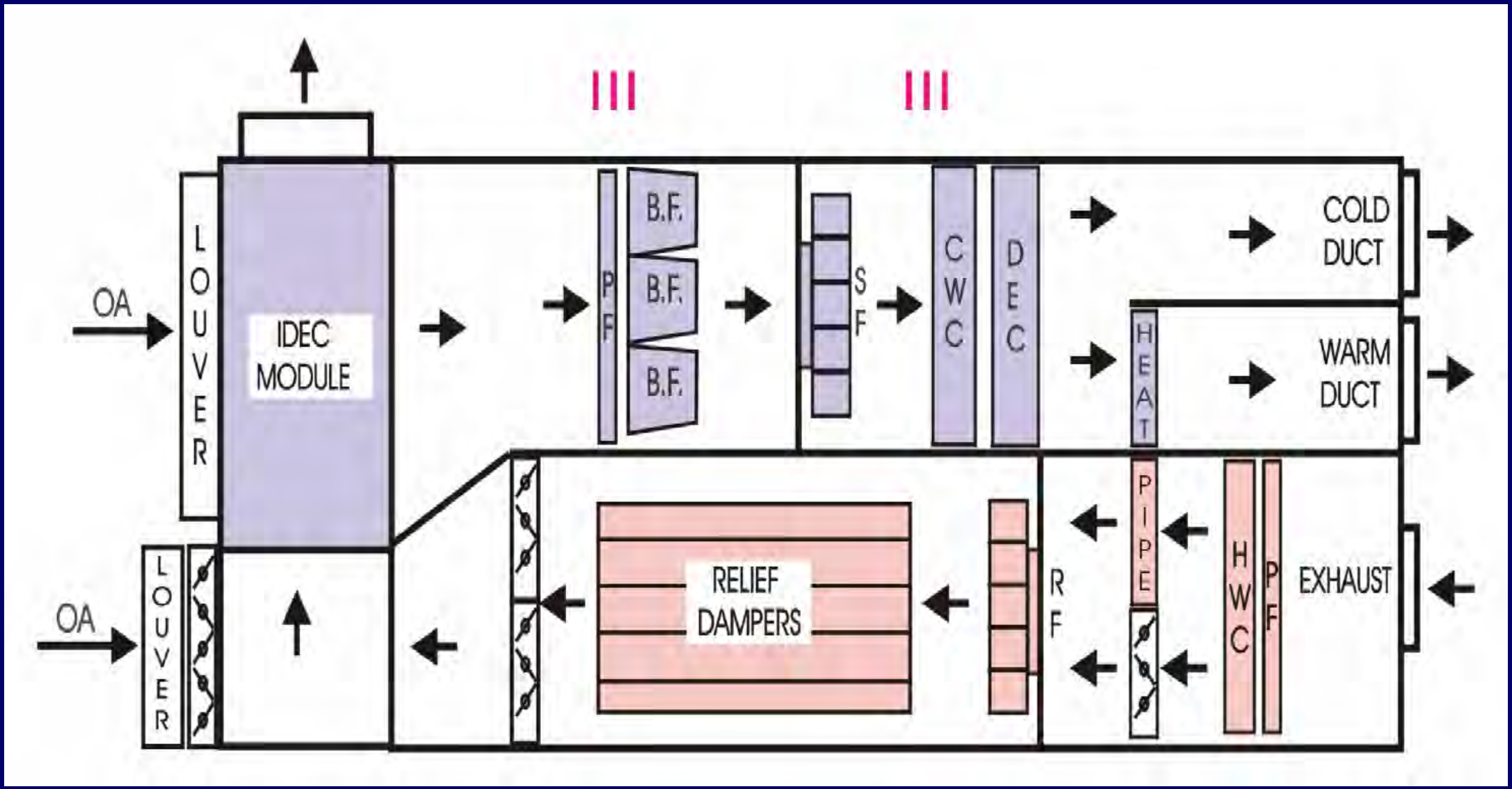
Wausau East High School
New Construction Profile

- 334,000 S/F
- 100% OSA (No Recirculation When Occupied)
- 100% Air Conditioned
- 0.6 CFM Per S/F
- 220 Tons (Nominal) Chilled Water Plant
- 6 MMBH Boiler Plant (100% Redundancy)
- Total Building Energy Usage: $0.68 Per S/F
  - State Average: $1.34 Per S/F

High Performance Hybrid HVAC Unitary Systems

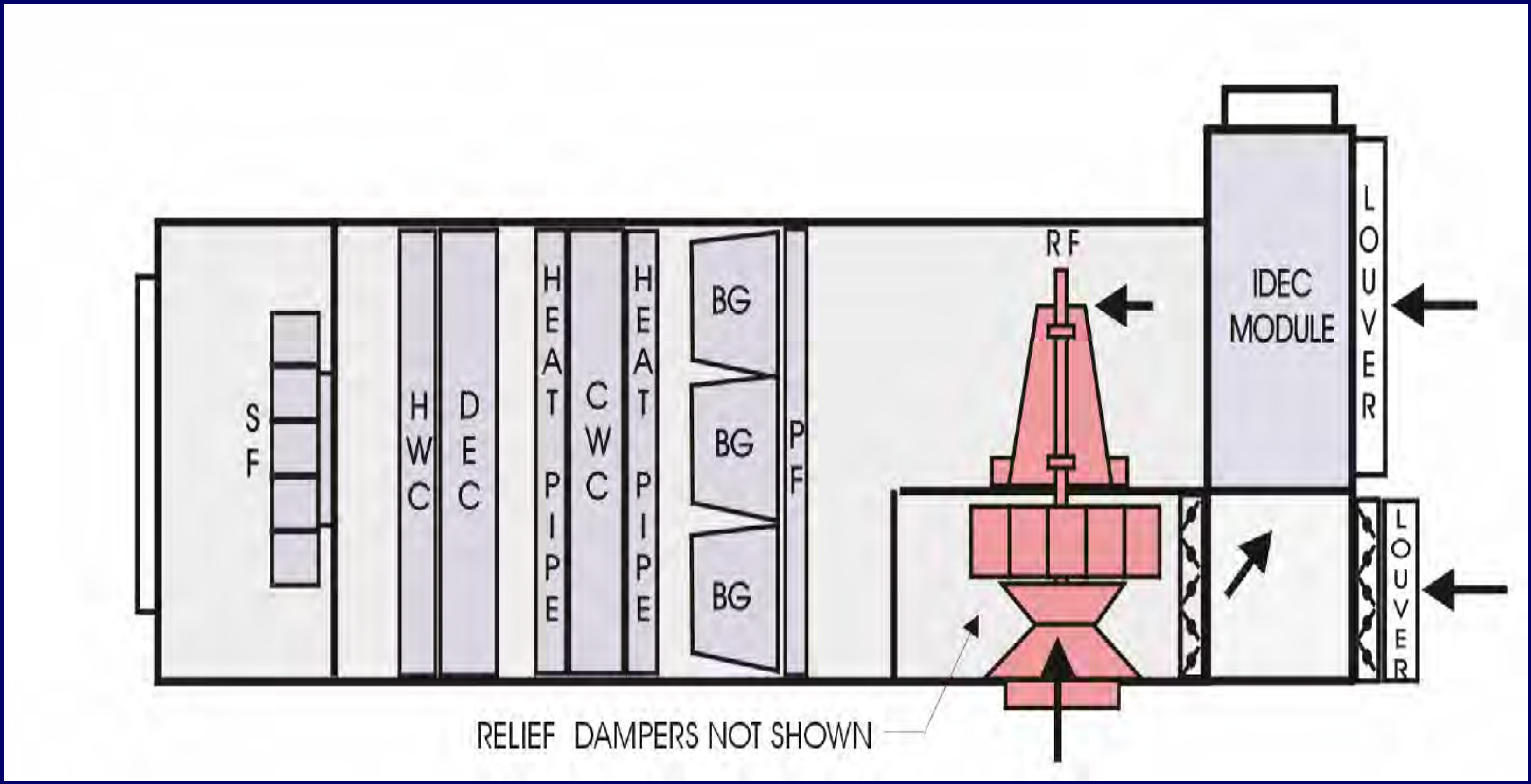
- Roof-top units can be designed with many of the same components and efficiencies of the built-up systems
  - Indirect evaporative precooling/preheating
  - Direct evaporative cooling/humidification
  - Evaporative condenser
  - Downsized centrifugal compressor and cooling coil
  - Downsized hot water coil or furnace
  - Dual duct and single duct configurations

High Performance Hybrid HVAC
Unitary Systems



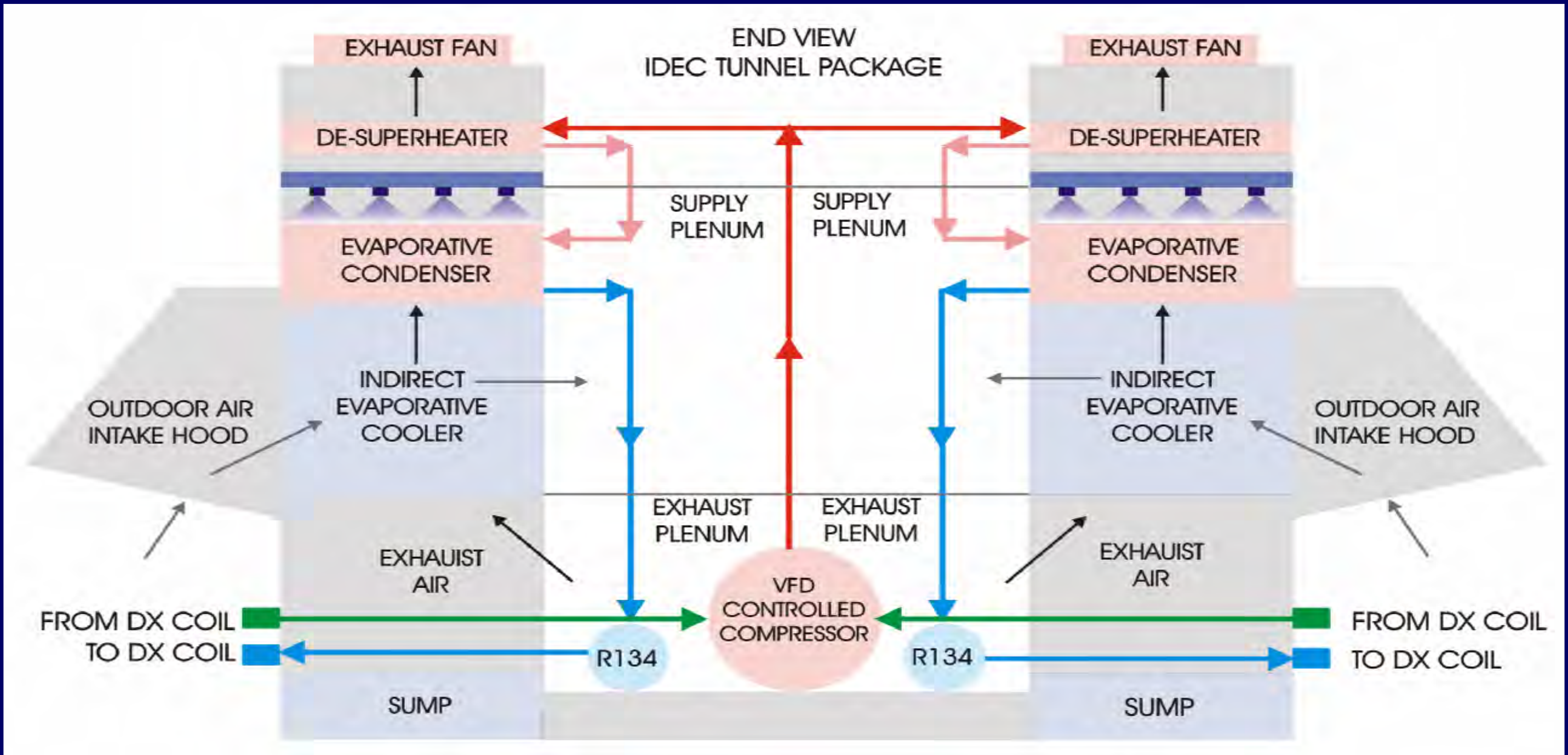
Dual Duct Unitary System

High Performance Hybrid HVAC
Unitary Systems



Single Duct Unitary System

High Performance Hybrid HVAC Unitary Systems



Refrigeration System EER’s in the **20’s**
Total System EER’s in the **50’s**

Evaporative Cooling
Does It Waste Water?

- So, everything sounds great, but…aren't we supposed to be conserving water for better sustainability?
- Absolutely…and evaporative cooling does!
- Evaporative based hybrid systems, when taking into account power plant point of production water usage:
  - Use about the same amount of water as an air cooled system
  - Use less water than a water cooled system
  - Use a lot less water than a ground source heat pump system

Conclusions

- Classical HVAC system strategies and equipment are not meeting your needs:
  - They are constructed around energy intensive processes
  - Recirculation compromises IAQ and energy efficiency
- In seeking a solution, avoid "one solution fits all" thinking. This leads to the "cookie cutter" approach to design so prevalent in the HVAC industry.
- Truly green HVAC systems are attainable with simple technologies that are readily available.

Conclusions

- Benefits of these green systems:
  - Competitive construction/first costs
  - Improved indoor air quality
  - ***Significantly*** reduced energy consumption/costs
  - Smaller heating/cooling plants
  - Easy to maintain
  - Economic solution for the CBW problem
- In short, a “win-win-win” solution for a tough problem!

Questions And Comments

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(630) 233-8358 (Fax)
LShapiro@interaccess.com

Minds Over Matter

Lock Gate Replacement System

National Defense Industrial Association
2005 Conference
St Louis, MO
August 2-5

BARNHART

Minds Over Matter

Presenters

Shaun A. Sipe

Project Engineering and Operations Manager

Barnhart

Project Services Group

Will Smith

Project Sales Representative

Barnhart

Civil Market

MEMBER SC&RA

EQA ISO 9001 Registered Firm UKAS QUALITY MANAGEMENT 047

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Minds Over Matter

The Scope

Provide a suitable Lifting Device to Remove and Replace both Lower Pool Lock Gates. These Lock Gates shall be completely assembled for both removal and installation with the following dimensions:

- 85’ Tall
- 65’ Wide
- 7’ Thick
- 360 Tons / Each

Additional Scope Requirements

The successful solution will provide a way to handle complete installation of the Gates within 30 Days. (Extending work beyond the scheduled outage would have severe economic effects on the region).

Competitive Advantage

The ability to perform the work of replacing the gates "in the dry" would provide a higher degree of safety and allow the Corps of Engineers to perform functions that had not been done in decades.

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The Solution

A portable, high capacity bridge crane that would span the Lock and replace the gates, and do so “in the dry.”

Barnhart was awarded the Project with approximately 3 weeks to prepare.

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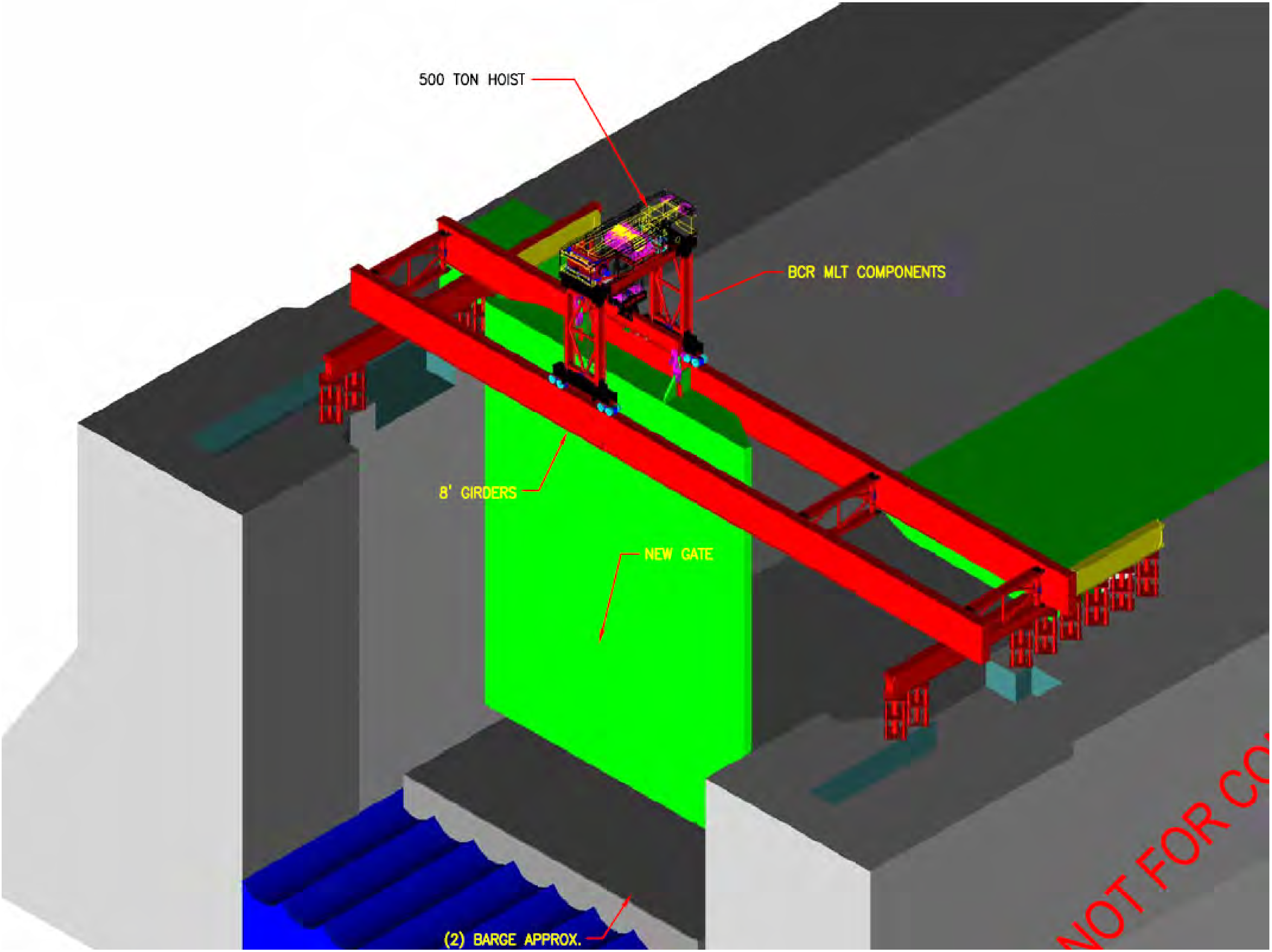
500 TON HOIST
BCR MLT COMPONENTS
8' GIRDERS
NEW GATE
(2) BARGE APPROX.
NOT FOR CO

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Minds Over Matter

ENGINEERING AND PLANNING

- Challenges
  - The Span
  - The Weight (360 Tons Each)
  - The Obstructions
    - The Operations Room and the Maintenance Room
    - The “Voids” in the Lock Wall surface for mechanical access
  - Tailing the Load
  - Securing the Gates for Dewatering
  - The Weather (Hurricane Ivan)
  - The Schedule (30 Days)

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The Planning Phase

- Design and Fabrication (3 Weeks!)
- Two Important Load Tests
  - One in Memphis for Full Functionality
  - One in Alabama using the 330 Ton Crawler as the Test Load
- Component Load Out for Rapid Assembly
- Safety At Every Step

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BARNHART
BARNHART
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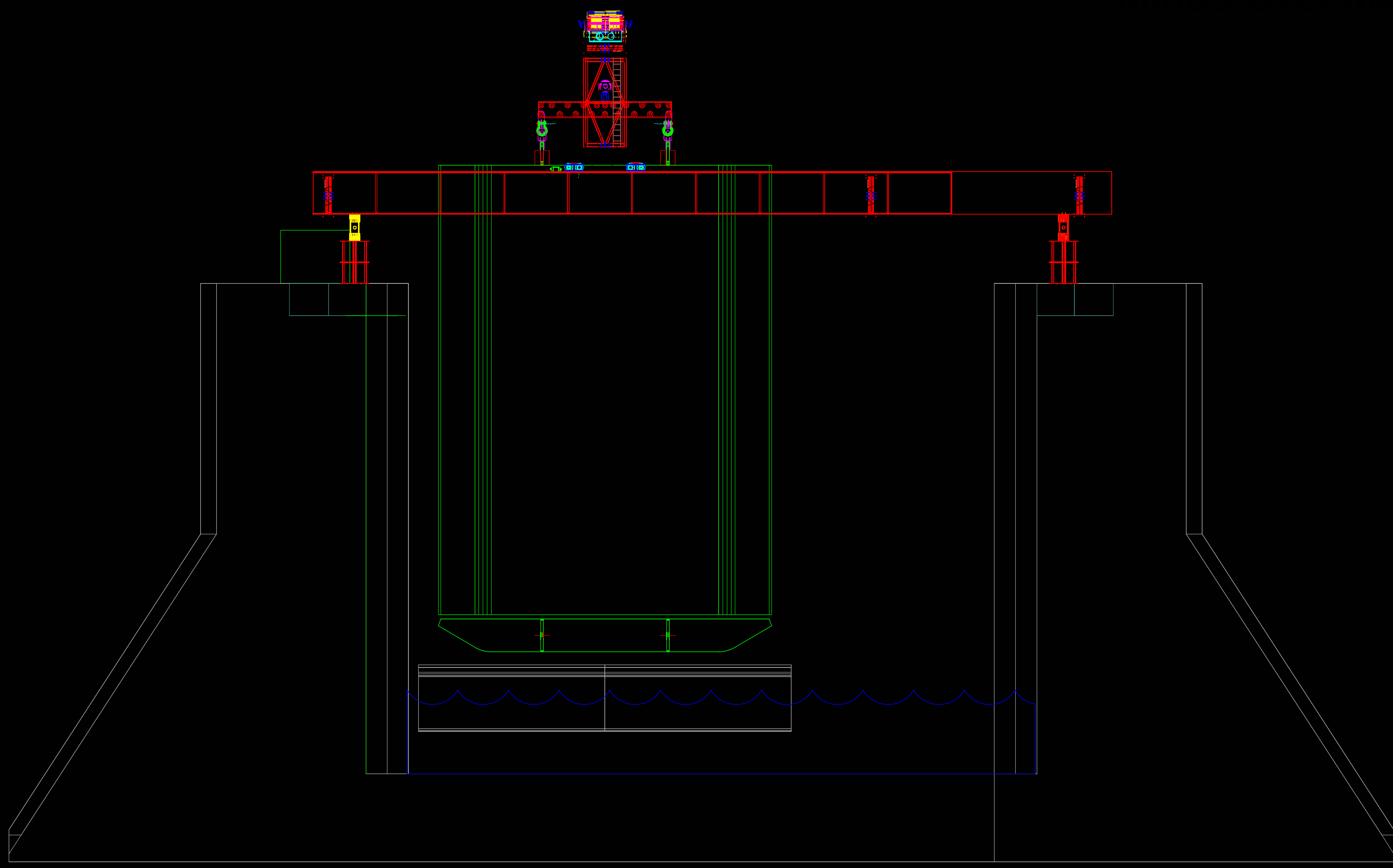

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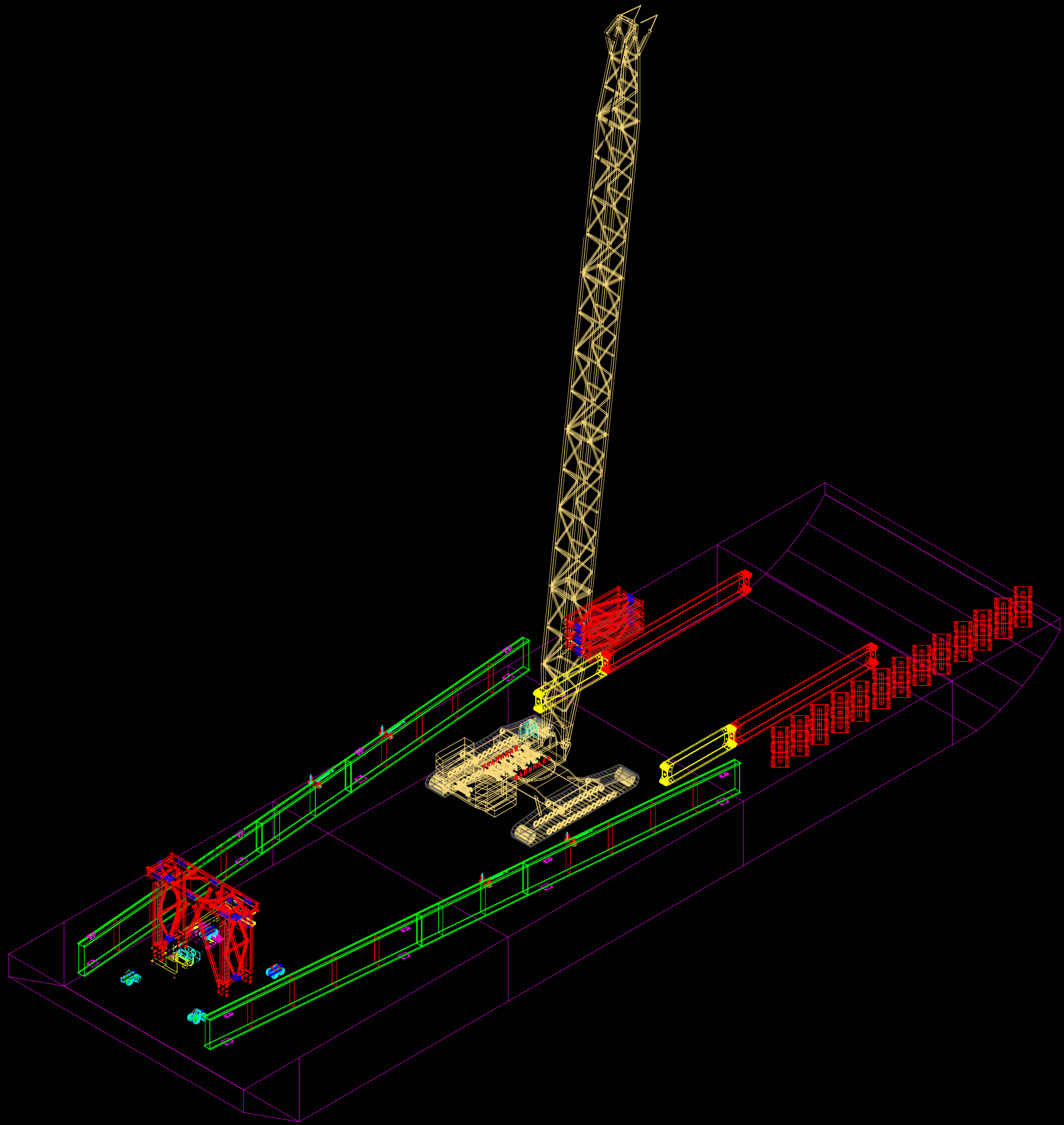
047



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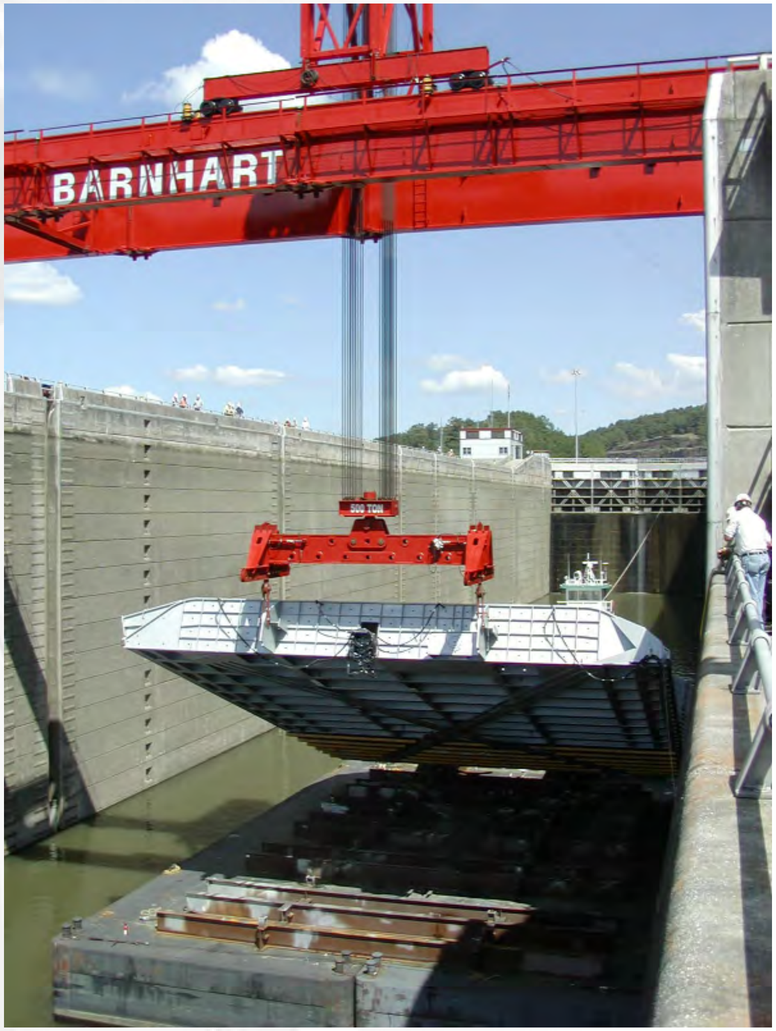
18 3:06 PM


BARNHART
20 8:10 AM

Minds Over Matter

Project Execution

Removal and
Replacement
Procedure



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Each leaf was removed by rotating it out of its “hinges”, lifting it between the 8’ Deep Trolley Girders, and lowering it onto a barge using the barge as the tailing device.


22 1:42 PM

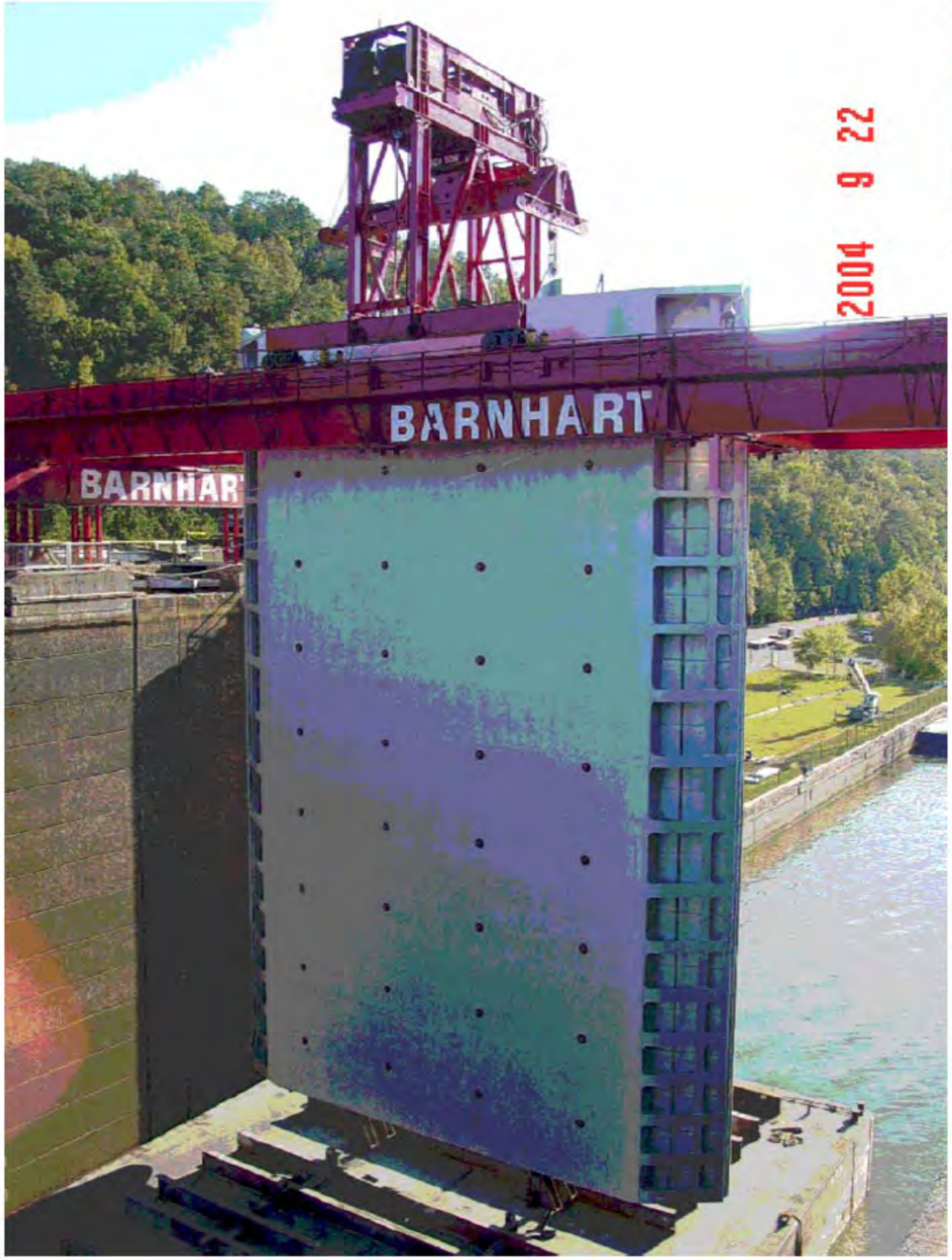

HART
22 1:42PM

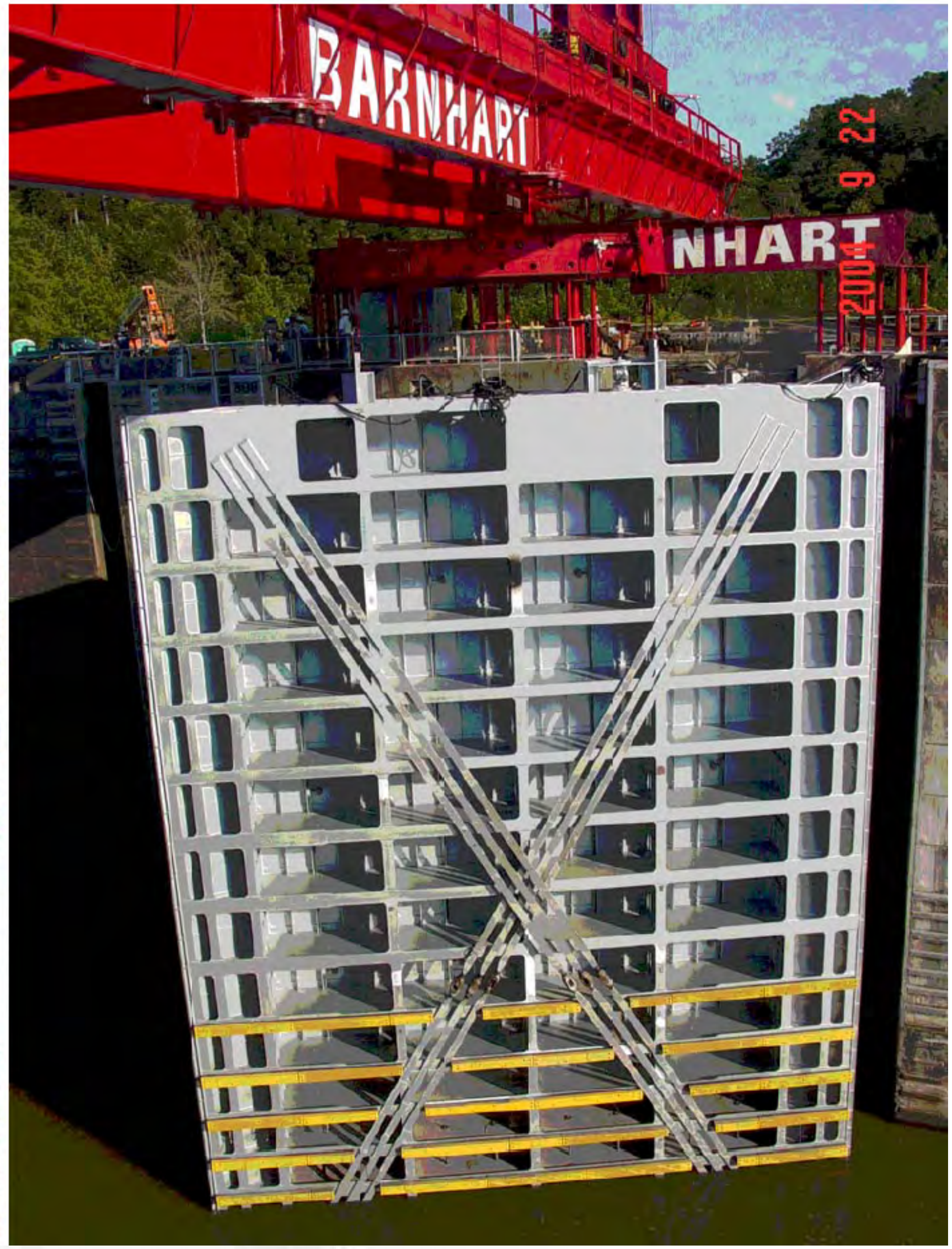
BARNHART

Minds Over Matter

Installation and Dewatering

After the New Gates were removed from the delivery barge and temporarily installed, the Lock would be dewatered for final installation and inspection procedures.





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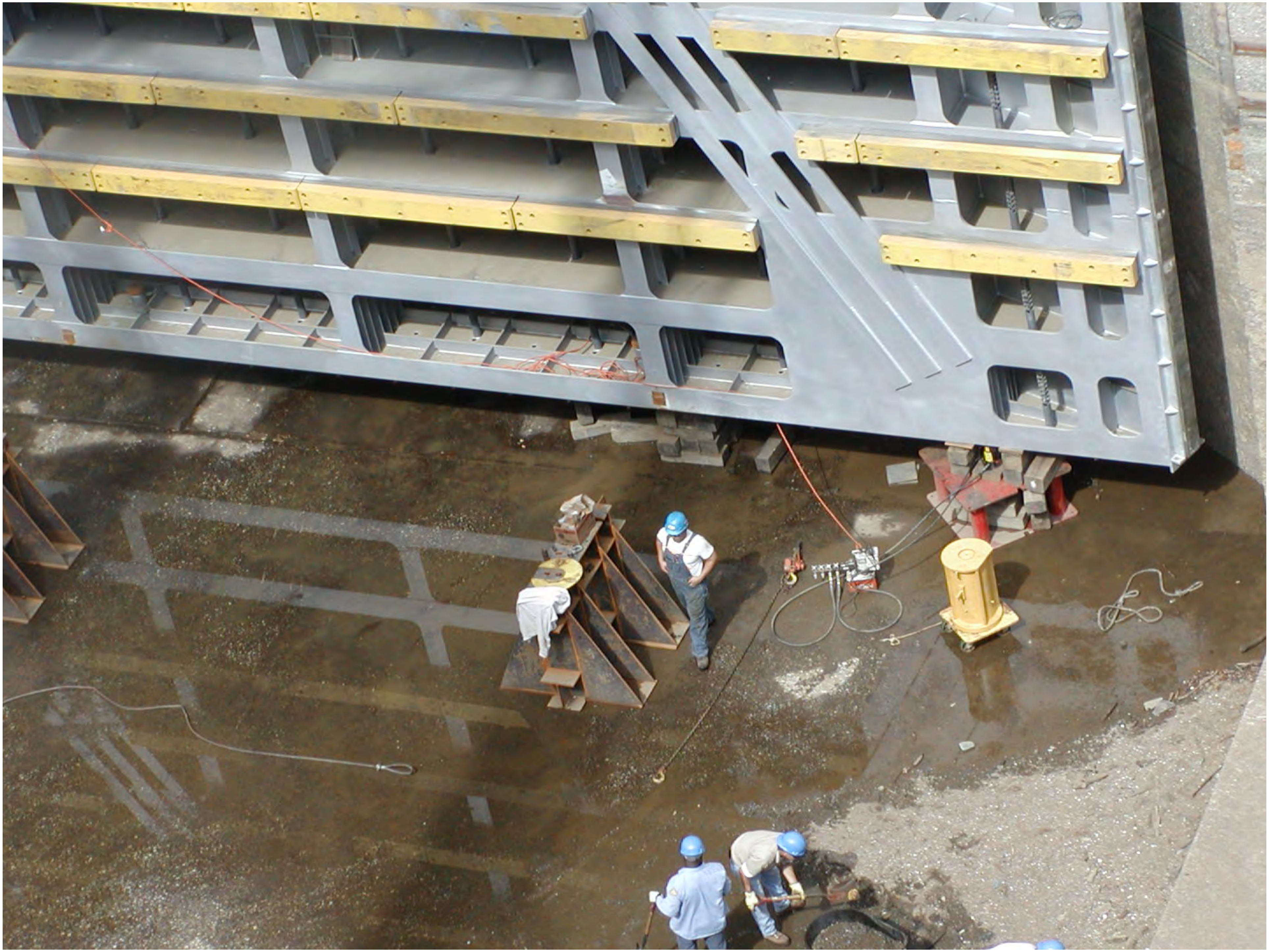

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INNOVATION AND INGENUITY

- Newly Designed Equipment
  - Trolley Gantry utilizing the BCR Containerized 500 Ton Hoist
  - BCR Gripper System w/ Wheel Mounted End Trucks
- Modification of Existing Equipment
  - 150’ Long, 8’ Deep Box Girders were developed using existing 60’ Long Girders. (60’, 90’, 120’, 150’ Lengths)

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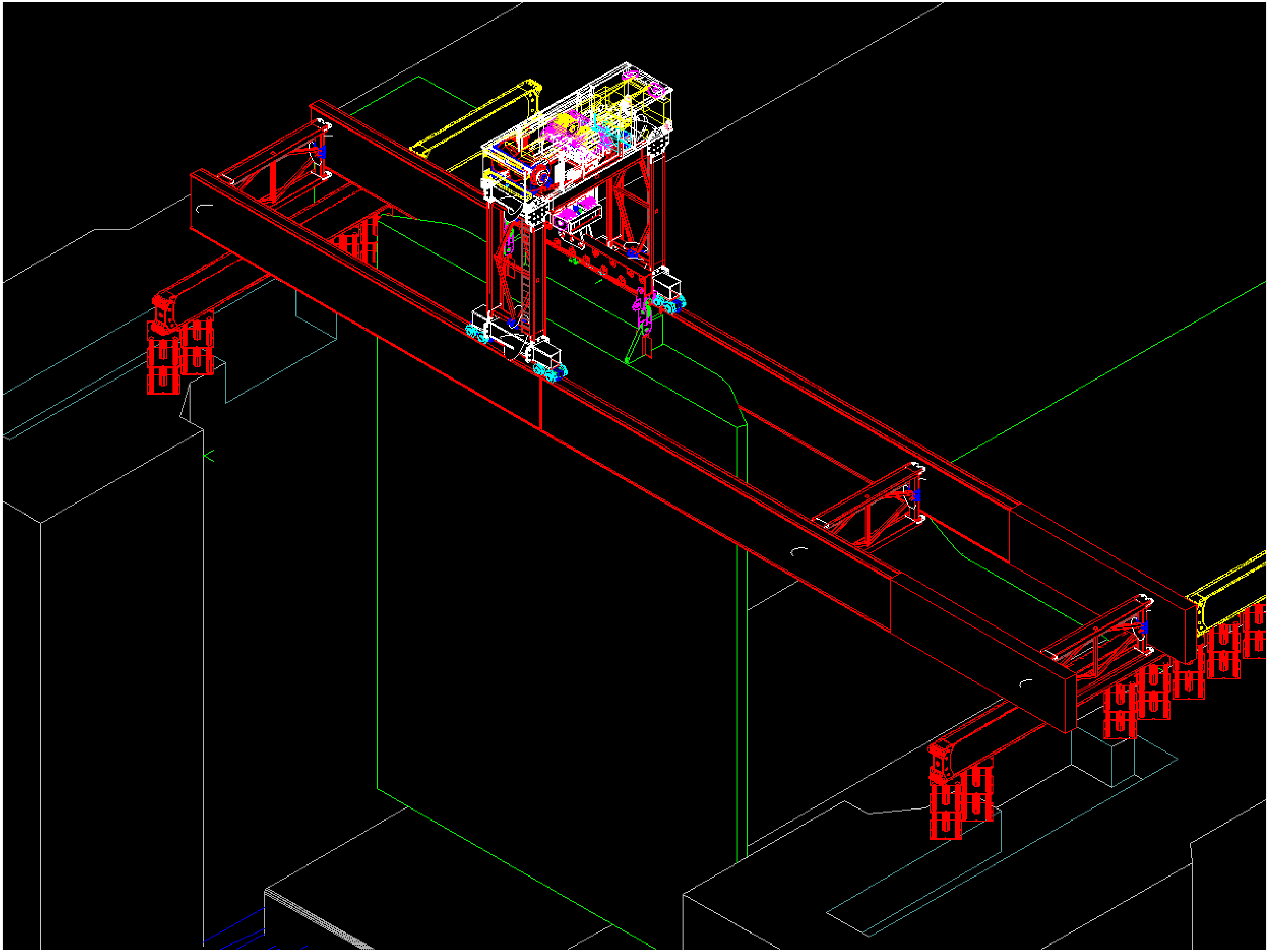
Minds Over Matter

BCR 8’ DEEP, 150’ LONG BOX GIRDERS

LATERAL TORSIONAL BUCKLING

TEREX
BAR
T



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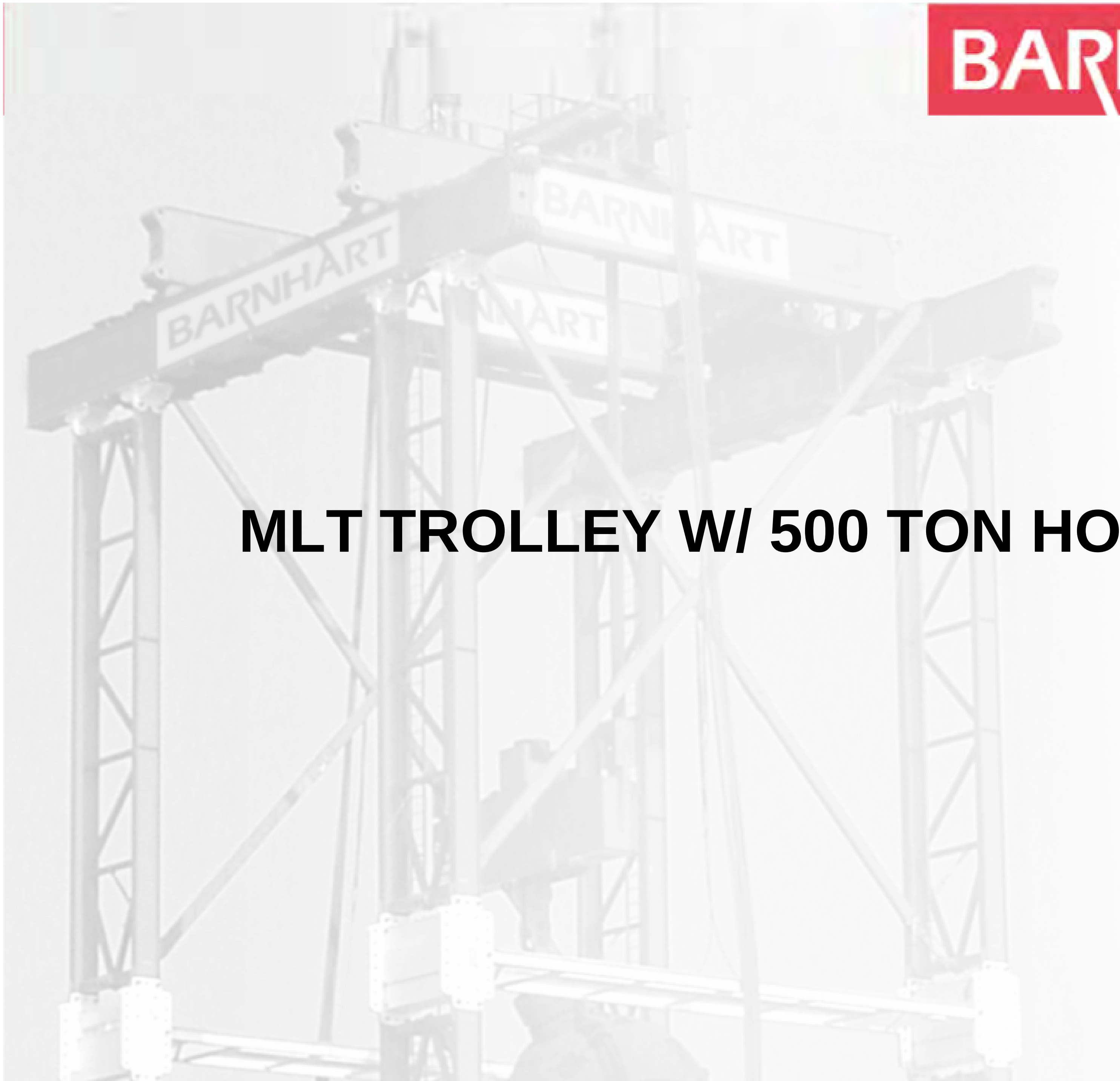

MLT TROLLEY W/ 500 TON HOIST

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BARNHART
CAP 500T

BARNHART

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FINITE ELEMENT ANALYSIS

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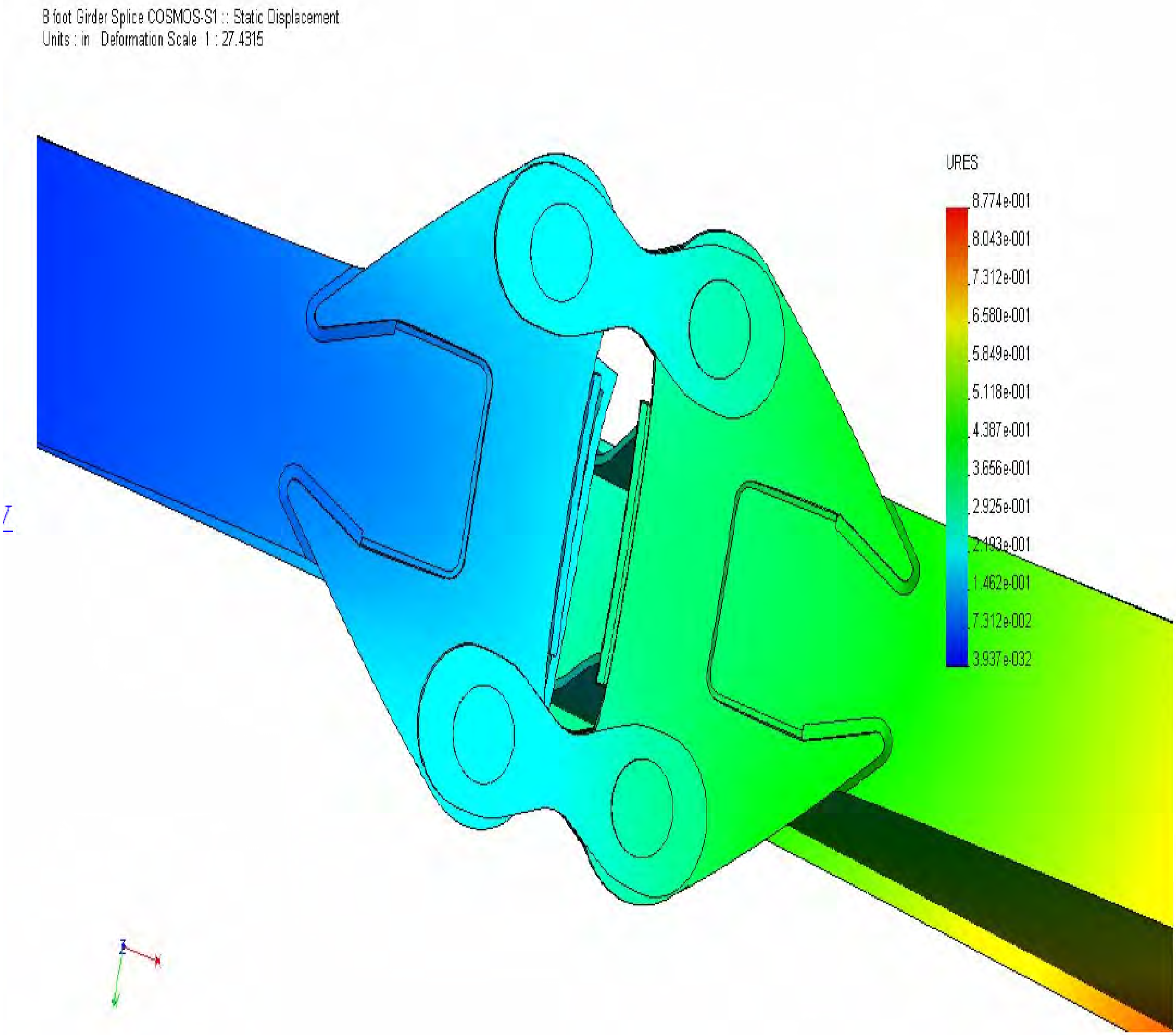
8 foot Girder Splice COSMOS-S1 :: Static Displacement
Units : in Deformation Scale 1 : 27.4315
URES
8.774e-001
8.043e-001
7.312e-001
6.580e-001
5.849e-001
5.118e-001
4.387e-001
3.656e-001
2.925e-001
2.193e-001
1.462e-001
7.312e-002
3.937e-032


BARN
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BCR WHEELED GRIPPER SYSTEM

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NHART

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COMMERCIAL LIMITATIONS

This Project was a **Fixed, Lump Sum** Proposal with an agreement to accept **liquidated damages** for exceeding scheduled outage days.

Barnhart completed assembly, removal, replacement, dewatering procedure and permanent installation lifting within **15 days**.

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SAFETY OVERVIEW

- No OSHA Recordables
- No First Aids (Includes Load Test, Load Out, Erection, and Execution)
- Daily Safety Meetings with Corps
- Pre-Lift Meetings with Job Assignments for the Crew
- 100% Remote Operations
- Met or exceeded Army Corps of Engineers Safety Manual Requirements
- Awarded Army Corps of Engineers Annual Safety Award

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Barnhart’s Key to Fit Any Lock

Thank You

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BARNHART

Minds Over Matter

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Electrical Military Workshop

Infrastructure Systems Conference

August 05

Electrical- Military Workshop

Professional Development Hours

Monday Through Thursday

19 PDHs

Electrical - Military Workshop

Today (Wednesday)

8:00-9:30	Tri-Service Criteria Overview
10:30-12:00	Lighting Criteria Information Technology Criteria
2:00-3:30	Mass Notification System Electronic Card Access Locks
4:00-5:30	Lightning Protection

Electrical - Military Workshop

Thursday

8:00-9:30	Electronic Security
	Airfield Lightning Protection, Grounding & Lighting
10:30-12:00	Electrical Safety and Arc Flash
	Electrical Infrastructure in Iraq

Electrical - Military Workshop

Thursday

Training Session

1:00-5:00   2005 NEC Code Changes

Tri - Service
Electrical Criteria

Infrastructure Systems
Conference
August 05

Tri-Service Electrical Criteria

- Origin of Tri-Service Criteria Mandate
- Introduction of Electrical Working Group
- Review of UFC and UFGS Initiatives
- Whole Building Design Guide
- Non-Government Standards Contract
- Questions

DOD Unified Facilities Criteria

- Implemented by 29 May 2002 letter from USD E.C. Aldridge

- MIL-STD-3007B, 1 April 2002, Standard Practice for Unified Facilities Criteria and Unified Facilities Guide Specifications

Tri-Service Electrical Working Group

- **Corps of Engineers**

  Bob Billmyre

  Bob Fite

- **Navy**

  John Peltz

  Richard Cofer

- **Air Force**

  Larry Strother

  Daryl Hammond

Unified Facilities Criteria (UFC)

- Design Criteria to replace TMs, AFMANs, MIL-HDBKs, etc.
- Updates - true Tri-Service documents
- Some existing Documents have been renumbered
- See UFCs on WBDG
  (http://65.204.17.188/report/doc_ufc.html)

UFC - Progress Overview

Series 3-500 Elect *	5 / 03	7 / 05	200X
Total Scheduled	57	37	22
- Unified	43	22	22
- Air Force Only	5	2	0
- Army Only	4	3	0
- Navy Only	3	10	0
Total Published	2	13	22
- Unified	2	6	22
- Air Force Only	0	0	0
- Army Only	0	2	0
- Navy Only	0	5	0

* (incl 2 in 4-020 Sec)

UFC - Progress Overview (Cont'd)

Series 3-500 Elect	5 / 03	7 / 05	200X
Total In Progress	15	19	0
- Unified	3	11	0
- Air Force Only	5	2	0
- Army Only	4	1	0
- Navy Only	3	5	0
Total In Planning	38	5	0

Unified Facilities Criteria (UFC)

Published, Tri-Service:

3-510-01	Foreign Voltages
3-520-01	Interior Electrical Systems
3-570-06	Cathodic Protection O&M
3-580-10	NMCI Std Constr Practices
4-021-01	Mass Notification Systems

Unified Facilities Criteria (UFC)

Published, Not Tri-Service:

3-501-03 N	Elect Eng Prelim Des Consid
3-540-04 N	Diesel Elect Gen Plants
3-550-03	Exterior Elect Distrib - 2 vers.
3-560-10 N	Electrical Safety
3-570-02	Cathodic Prot Des- 2 vers.
4-020-04 FA	Electronic Security Systems
4-021-02N	Electronic Security Systems

Unified Facilities Criteria (UFC)

Completed, in approval process:

3-530-01	Lighting
3-535-01	Airfield Lighting (Vol I)
3-580-01	Telecom, Inside Plant

Unified Facilities Criteria (UFC)

Final Draft in Review:

3-500-10N	Elect Design (incl design-build)
3-500-05	RF Shielded Enclosures
3-560-01	Electrical Safety
3-575-01	Lightning Protection
4-021-02N	Electronic Security Systems

Unified Facilities Criteria (UFC)

In Progress:

3-500-04	Battery Rooms
3-500-10	Electrical Design
3-535-02	Airfield Lighting, (Vol II)
3-550-01	Exterior Electrical Distribution
3-570-07	Cathodic Protection Design
3-580-02	Telecom, Outside Plant
4-021-XX	Electronic Security PV
4-021-XX	Electronic Security Testing
4-021-02 A	Electronic Security System

Unified Facilities Guide Specs (UFGS)

Simple Concept

- Existing: UFGS 16xxxN
  UFGS 16xxxA
- Updated to: UFGS 16xxx
- Master Format – upcoming
- Current Listings on WBDG

http://www.wbdg.org/design/ufg_specs.php

Master Format Overview

- Current #'s per 1995 Const Specs Institutes (CSI)
- CSI rev and exp #'s in 2004, see (http://www.csinet.org/s_csi/docs/9400/9361.pdf).
- Previous 16 Divs exp to 49 Divs for rapid dev areas
- Div 13 Sec - to Div 28
- Div 16 Pwr – Most to Div 26, Some to 33
- Div 16 Telcom & Spec Syst – Most Div 27, Some 33
- Div 16 Fiber and VFDs - to Div 40

Unified Facilities Guide Specs (UFGS)

Master Format Overview (Cont'd)

- Navy, Army, Air Force and NASA to MasterFormat 2004
- UFGS sect #'s use new syst to level 4 (XX XX XX.XX)
- Additional level 5 planned to replace the "A" and "N"
  - Instead of "A" use XX XX XX.XX 10
  - Instead of "N" use XX XX XX.XX 20
- Other agencies (NASA, VA, EPA, GSA) joining UFGS would carry extensions (30, 40, 50, etc)
- Goal - Revised # ' s early as Oct 2005

UFGS - Progress Overview

	2003	2005	200X
Div 13 Spec Syst			
- Total	20	21	14
- Unified	2	5	14
- Army Only	9	7	0
- Navy Only	9	9	0
Div 16 Electrical			
- Total	77	64	49
- Unified	2	19	39
- Army Only	36	29	0 (10cw)
- Navy Only	39	16	0

Highlights

- 16050N, Basic Elect Materials & Methods – will be eliminated and content incorp in individual specs
- 16081, Apparatus Inspection & Testing - adopted by all services

Unified Facilities Guide Specs (UFGS)

Interior Electrical

- 16402 incorp / replaced 16415A & 16402N
- Separate lighting specs & plates –
  - Interior 16510 & Exterior 16520
- Separate sw board & sw gear spec - 16442
- Separate VFD spec16261 - in progress
- Unified UPS spec 16262 – in progress

Exterior Electrical

- UG - 16302 in progress incorp 16375A
- Aerial – 16301 in progress incorp 16370A

With separate supporting specs for:

- 3 ph transformers 16272
- 1 ph transformers 16273
- SF6 padmount switchgear 16341N
- Secondary unit substations 16360
- Primary unit substations 16361N

Unified Facilities Guide Specs (UFGS)

Engine Generators

- Upcoming - Merge 16237N with 16263A & 16264A to create one or two UFGS
- 16230N, 16231N, 16232N, 16233N, 16234N have been eliminated
- 16236N MG sets used by waiver only

Unified Facilities Guide Specs (UFGS)

Electronic Systems

- Electronic Security - Merge 13720A & 13721A with 13702N & 13703N (in final new draft)
- CCTV – new 16751 in progress
- Telecom – Interior 16710 & Exterior 16711 replaced previous Army and Navy versions

Unified Facilities Guide Specs (UFGS)

Miscellaneous Merges

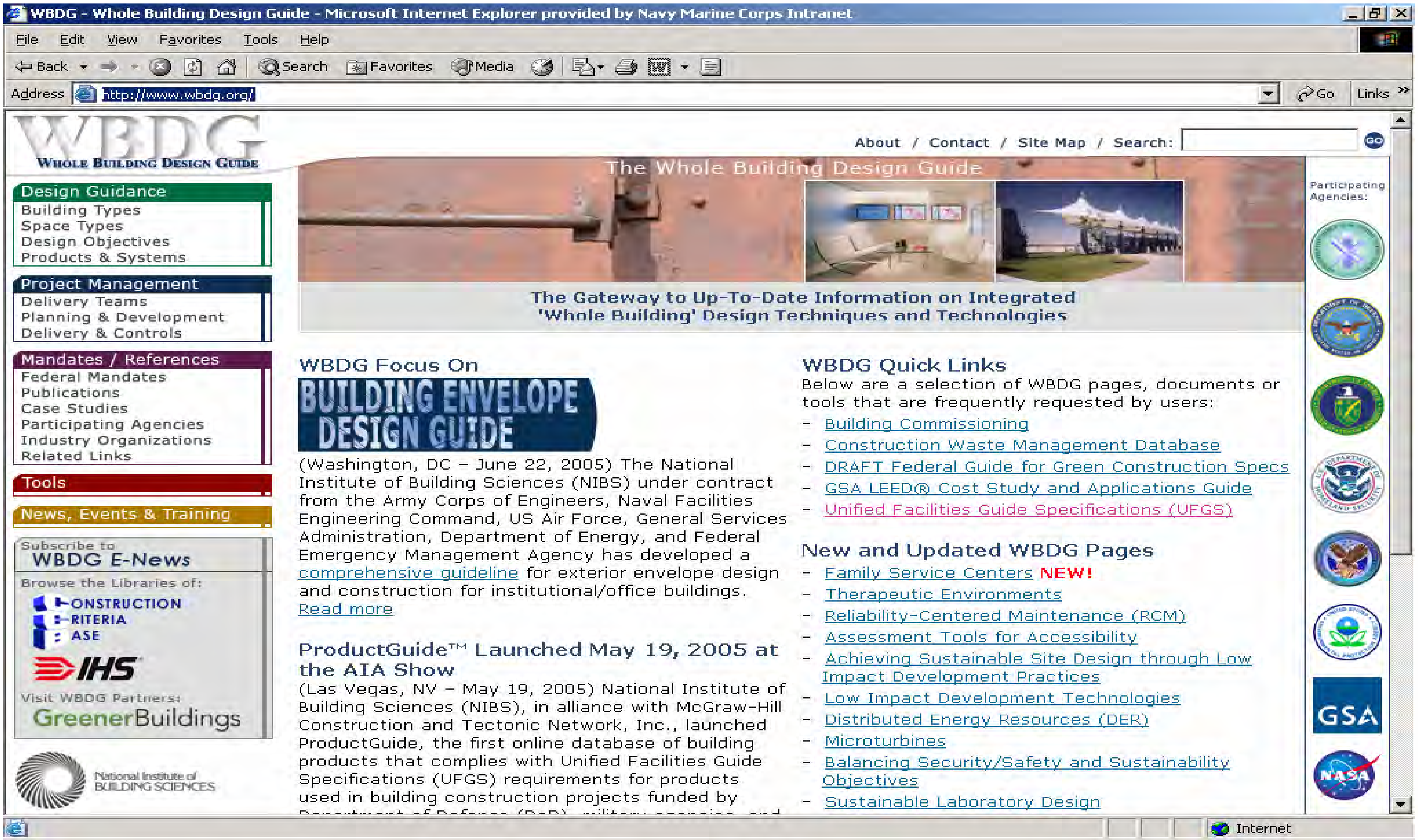
- Airfields - 16522N, 16525A, 16526 A - Planned
- LP- 13100N & 13100A - Final draft in prog
- Cath Prot - 13110-12N, 13110-12A - Planned
- ATS - 16410N, 16410A - In progress
- Intercom - 16721A, 16822N - Final draft in rev
- Shielding - 13092N, 13090A - Planned

Tri-Service Electrical Criteria

Whole Building Design Guide
"htttp://www.wbdg.org/"

- Links to UFC, UFGS, and Non-Government Standards Contract (IHS)
- IHS has most standards referenced in UFGS and UFCs
- Link to IHS via Army: "http://www.wbdg.org/pdfs/army_ihs_brochure.pdf"
- Link to IHS via Navy: "https://login.ihserc.com/cgi-bin/ihslogin?"

Whole Building Des Guide (wbdg.org)



WBDG - Whole Building Design Guide - Microsoft Internet Explorer provided by Navy Marine Corps Intranet

File Edit View Favorites Tools Help

Back Search Favorites Media

Address http://www.wbdg.org/ Go Links

WBDG Whole Building Design Guide

About / Contact / Site Map / Search: GO

The Whole Building Design Guide

The Gateway to Up-To-Date Information on Integrated 'Whole Building' Design Techniques and Technologies

Design Guidance
- Building Types
- Space Types
- Design Objectives
- Products & Systems

Project Management
- Delivery Teams
- Planning & Development
- Delivery & Controls

Mandates / References
- Federal Mandates
- Publications
- Case Studies
- Participating Agencies
- Industry Organizations
- Related Links

Tools

News, Events & Training

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IHS

Visit WBDG Partners: GreenerBuildings

National Institute of Building Sciences

WBDG Focus On

BUILDING ENVELOPE DESIGN GUIDE

(Washington, DC – June 22, 2005) The National Institute of Building Sciences (NIBS) under contract from the Army Corps of Engineers, Naval Facilities Engineering Command, US Air Force, General Services Administration, Department of Energy, and Federal Emergency Management Agency has developed a comprehensive guideline for exterior envelope design and construction for institutional/office buildings. Read more

ProductGuide™ Launched May 19, 2005 at the AIA Show

(Las Vegas, NV – May 19, 2005) National Institute of Building Sciences (NIBS), in alliance with McGraw-Hill Construction and Tectonic Network, Inc., launched ProductGuide, the first online database of building products that complies with Unified Facilities Guide Specifications (UFGS) requirements for products used in building construction projects funded by

WBDG Quick Links

Below are a selection of WBDG pages, documents or tools that are frequently requested by users:

- Building Commissioning
- Construction Waste Management Database
- DRAFT Federal Guide for Green Construction Specs
- GSA LEED® Cost Study and Applications Guide
- Unified Facilities Guide Specifications (UFGS)

New and Updated WBDG Pages

- Family Service Centers NEW!
- Therapeutic Environments
- Reliability-Centered Maintenance (RCM)
- Assessment Tools for Accessibility
- Achieving Sustainable Site Design through Low Impact Development Practices
- Low Impact Development Technologies
- Distributed Energy Resources (DER)
- Microturbines
- Balancing Security/Safety and Sustainability Objectives
- Sustainable Laboratory Design

Participating Agencies:

GSA

NASA

Internet

Department of Defense (DOD)

Participating Agencies Index > Department of Defense

sign Guidance
lding Types
ice Types
sign Objectives
ducts & Systems

ject Management
ivery Teams
nning & Development
ivery & Controls

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Unified Facilities Criteria Program

[Unified Facilities Guide Specifications (UFGS)](#)
[Unified Facilities Criteria (UFC) Technical Publications](#)
[Criteria Change Request (CCR)](#)
[Unified Facilities Space Program Spreadsheets](#)

The Department of Defense (DoD) and the military services have initiated a program to unify all technical criteria and standards pertaining to planning, design, construction, and operation and maintenance of real property facilities. The objective of the Unified Facilities Criteria (UFC) program is to streamline the military criteria system by eliminating duplication of information, increasing reliance on private-sector standards, and creating a more efficient criteria development and publishing process. Both technical publications and guide specifications are part of the UFC program. Previously, each service had its own publishing system resulting in criteria being disseminated in different formats. UFC documents have a uniform format and are identified by a number such as UFC 1-300-1.

Though unification of all DOD criteria is the ultimate goal, there are instances when a particular document may not apply to all services, or some documents may have not been fully revised to reflect all service requirements before being issued in the UFC system. In these instances, the UFC or UFGS document number will be followed by an alpha-designator, such as UFC 1-300-09N or UFGS 01320A. Alpha-designators are as follows:

A USACE

US Army Corps of Engineers®

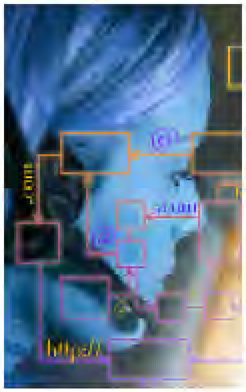
IHS Technical Solutions

NAVFAC
Naval Facilities Engineering Command

Non-Government Standards-IHS

IHS Technical Solutions

National Institute of BUILDING SCIENCES



Customer Support

Based on your Customer Service Plan, we can help you use our products more efficiently, provide documents and research assistance, resolve systems or access questions and answer your subscription questions. Please reference your account number, 7838506, when you call.

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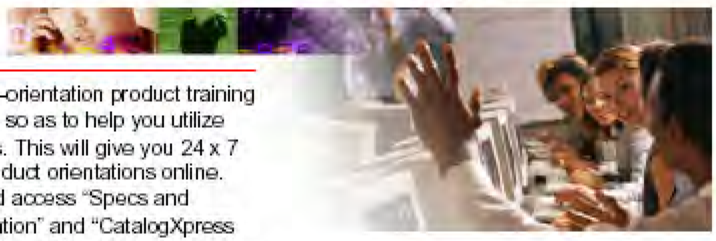
Web:	www.ihs.com/support



Training

IHS is providing e-orientation product training via IHS University so as to help you utilize the available tools. This will give you 24 x 7 access to IHS product orientations online. Log on to IHS and access "Specs and Standards Orientation" and "CatalogXpress Orientation" from the main menu.

Accessing IHS Products

Go to the Whole Building Design Guide Website:

http://www.wbdg.org

Choose the DoD Seal from the right. This will open the DoD Unified Criteria Program web page. A link to Information Handling Services is contained in the drop-down menu beneath the USACE seal - "Non-Government Standards - IHS". Click on this link. The web site will automatically log you in to the IHS subscription via your email address.

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IHS Account Number

7838506

IHS Account Manager

Technical Information Solution

Specs & Standards

ASME Boiler Pressure and Vessel Code

CatalogXpress®

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Tri-Service Electrical Working Group

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Any Questions ? ?

Thank - You ! !

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Seismic Protection

For Mechanical Equipment

What's Required?

- All architectural, mechanical, electrical, and other nonstructural components in structures shall be designed and constructed to resist the equivalent static forces and displacements determined in accordance with ASCE 7 Section 9.6. The design and evaluation of support structures and architectural components and equipment shall consider their flexibility as well as their strength.

ASCE 7

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Codes & Standards

- **IBC – International Building Code – International Code Council**
- **ASCE 7 – Minimum Design Loads for Buildings and other Structures - American Society of Civil Engineers**
- **NFPA 13 – Standard for the Installation of Sprinkler Systems – National Fire Protection Association**
- **UFC 3-310-04 – Seismic Design for Buildings (expected late FY)**
- **UFGS 15070 – Seismic Protection for Mechanical Eqiupment (expected late FY)**

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How Do I Get There From Here?

- Determine *Seismic Use Group* (IV, III, II, I) for the facility.

- Determine soil class (A, B, C, D, E, F). Use these and IBC Table(s) 16151.2 to select *Seismic Force Adjustment Factors* , F_s & F_v.

- Obtain *Maximum Considered Earthquake* seismic accelerations, % g for *Short* (0.2 sec) and long (*1* sec) accelerations, S_S & S_1, using "Shake Maps".

- Using *Site Coefficients,* F_s & F_v, calculate the *Adjusted (or Modified) Maximum Considered Earthquake*, which equals:

$$S_{MS} = S_S \times F_s \qquad \text{and} \qquad S_{M1} = S_1 \times F_v$$

- Calculate the *Design Earthquake* - S_{DS} & S_{D1}:

$$S_{DS} = 2/3\ S_{MS} \qquad \text{and} \qquad S_{D1} = 2/3\ S_{M1}$$

- Using these values, for S_{DS} and S_{D1}, refer to IBC 2003 Tables 1616.3(1) and 1616.3(2), and select a *Seismic Design Category* (A, B, C, D, or E and F) for each value, S_{DS} and S_{D1}, and the previously determined Seismic Use Group. The *WORST CASE* Seismic Design Category is to be used for the remainder of the design.

Seismic Use Groups

- **Group III structures are those having essential facilities that are required for post-earthquake recovery and those containing substantial quantities of hazardous substances.**
- **Group II structures are those whose failure would result in substantial human loss due to structural failure because of occupancy density.**
- **Group I structures are those not assigned to either Seismic Use Groups II, III, or IV.**

Seismic Use Groups

- ***Group IV structures are those considered to be mission-essential military assets which must function to support the strategic defense of the United States, or to prevent widespread catastrophic consequences due to release of nuclear, chemical, bioligical, or radiological materials.***

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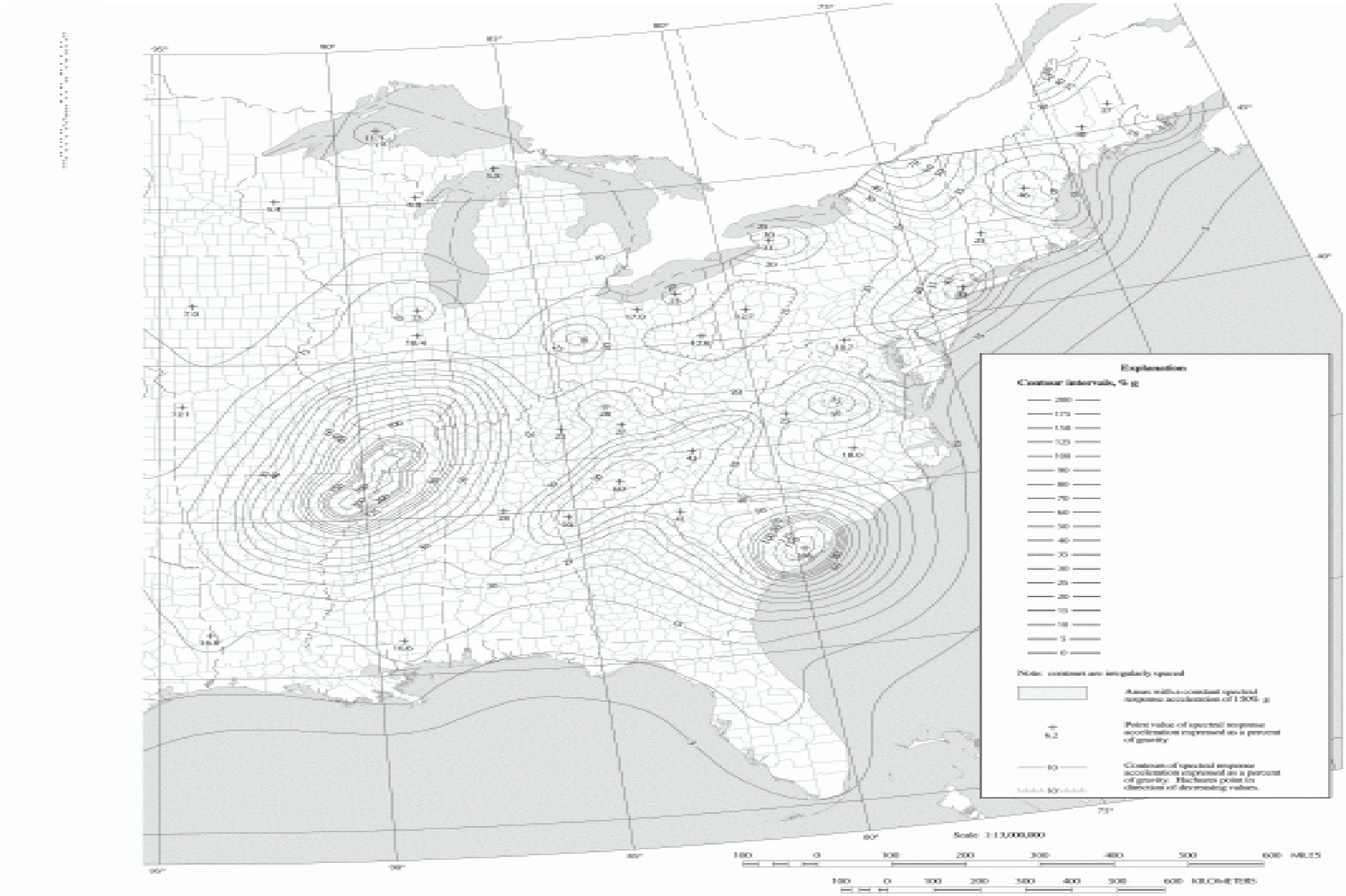
Site Class

TABLE 1615.1.1
SITE CLASS DEFINITIONS

SITE CLASS	SOIL PROFILE NAME	AVERAGE PROPERTIES IN TOP 100 feet, AS PER SECTION 1615.1.5		
		Soil shear wave velocity, $\bar{v}_s$, (ft/s)	Standard penetration resistance, $\bar{N}$	Soil undrained shear strength, $\bar{s}_u$, (psf)
A	Hard rock	$\bar{v}_s > 5{,}000$	N/A	N/A
B	Rock	$2{,}500 < \bar{v}_s \le 5{,}000$	N/A	N/A
C	Very dense soil and soft rock	$1{,}200 < \bar{v}_s \le 2{,}500$	$\bar{N} > 50$	$\bar{s}_u \ge 2{,}000$
D	Stiff soil profile	$600 \le \bar{v}_s \le 1{,}200$	$15 \le \bar{N} \le 50$	$1{,}000 \le \bar{s}_u \le 2{,}000$
E	Soft soil profile	$\bar{v}_s < 600$	$\bar{N} < 15$	$\bar{s}_u < 1{,}000$
E	—	Any profile with more than 10 feet of soil having the following characteristics: 1. Plasticity index $PI > 20$, 2. Moisture content $w \ge 40\%$, and 3. Undrained shear strength $\bar{s}_u < 500$ psf		
F	—	Any profile containing soils having one or more of the following characteristics: 1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils. 2. Peats and/or highly organic clays ($H > 10$ feet of peat and/or highly organic clay where H = thickness of soil) 3. Very high plasticity clays ($H > 25$ feet with plasticity index $PI > 75$) 4. Very thick soft/medium stiff clays ($H > 120$ feet)		

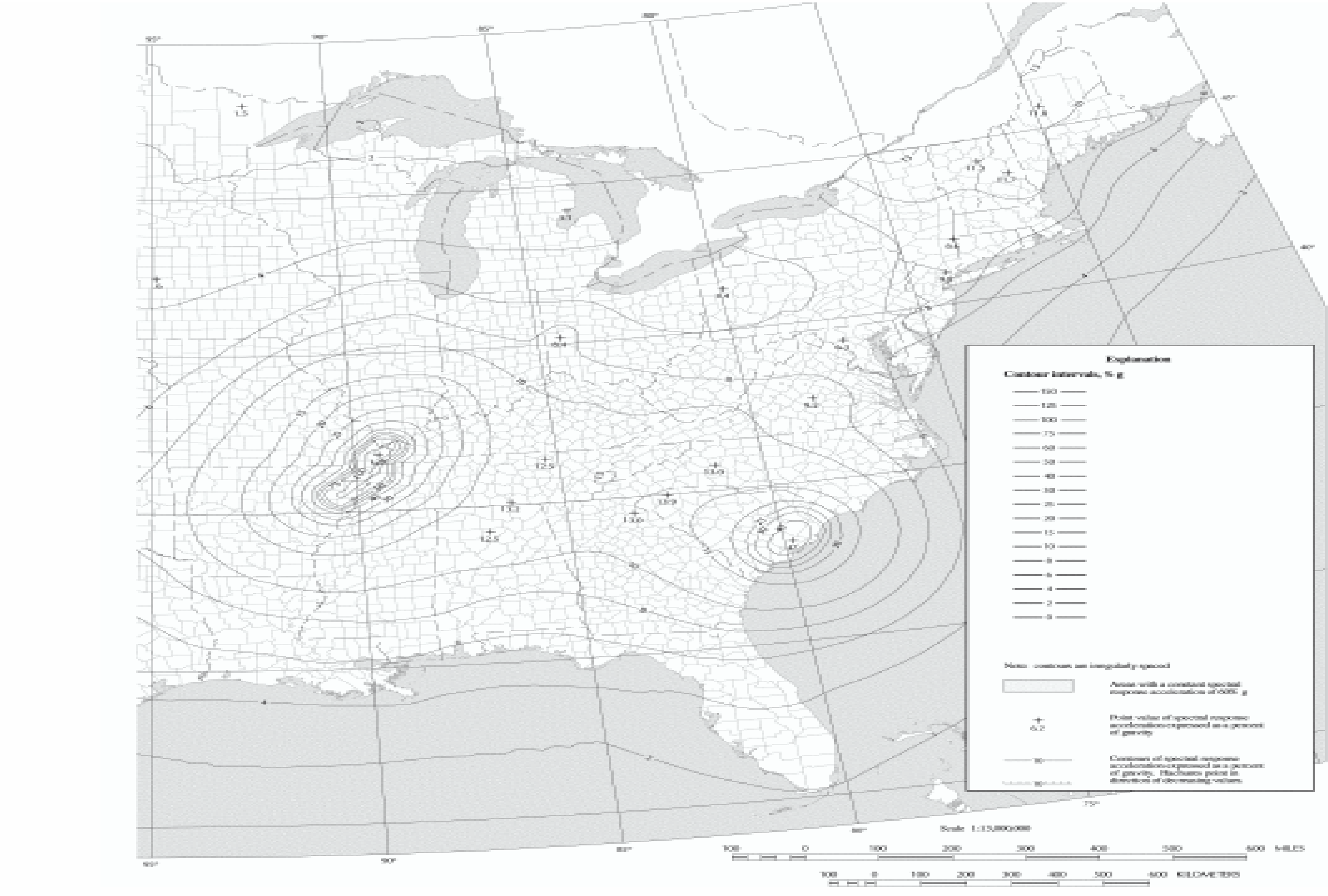
IBC 2003

Seismic Map - 0.2 Second Spectral Response



Seismic Map - 0.2 Second Spectral Response

Seismic Map – 1.0 Second Spectral Response

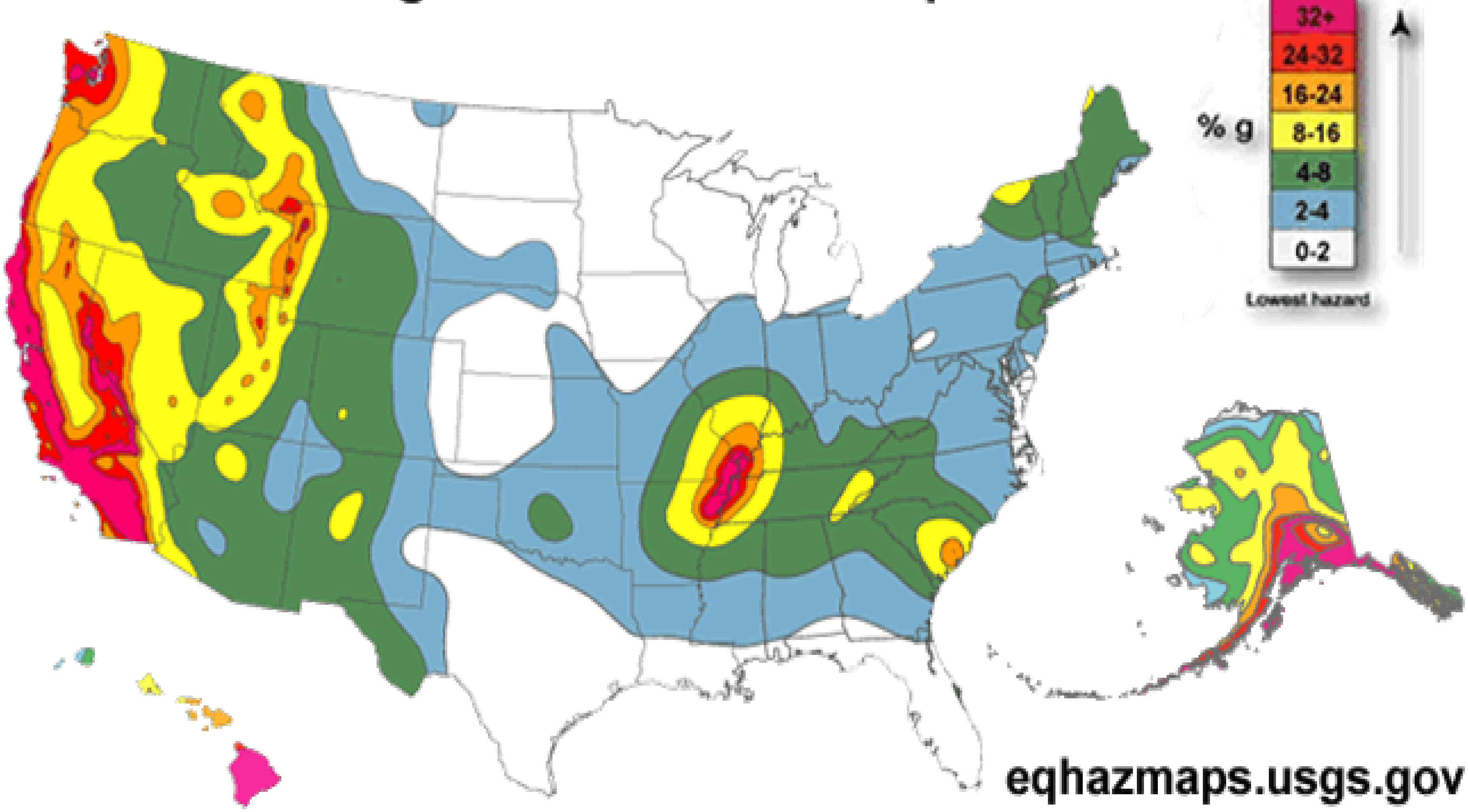


Seismic Map – 1.0 Second Spectral Response

USGS

science for a changing world

Ground-shaking hazard from earthquakes



eqhazmaps.usgs.gov

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Site Coefficients

TABLE 1615.1.2(1)
VALUES OF SITE COEFFICIENT F_a AS A FUNCTION OF SITE CLASS
AND MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS (S_S)[a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, S_S.
b. Site-specific geotechnical investigation and dynamic site response analyses shall be performed to determine appropriate values, except that for structures with periods of vibration equal to or less than 0.5 second, values of F_a for liquefiable soils are permitted to be taken equal to the values for the site class determined without regard to liquefaction in Section 1615.1.5.1.

TABLE 1615.1.2(2)
VALUES OF SITE COEFFICIENT F_V AS A FUNCTION OF SITE CLASS
AND MAPPED SPECTRAL RESPONSE ACCELERATION AT 1-SECOND PERIOD (S_1)[a]

SITE CLASS	MAPPED SPECTRAL RESPONSE ACCELERATION AT SHORT PERIODS				
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 \geq 0.5$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	Note b	Note b	Note b	Note b	Note b

a. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at 1-second period, S_1.
b. Site-specific geotechnical investigation and dynamic site response analyses shall be performed to determine appropriate values, except that for structures with periods of vibration equal to or less than 0.5 second, values of F_v for liquefiable soils are permitted to be taken equal to the values for the site class determined without regard to liquefaction in Section 1615.1.5.1.

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Adjusted Maximum Considered Earthquake

The site class *Adjusted Maximum Considered Earthquake* spectral response accelerations for short periods, S_{MS}, and at 1-second period, S_{M1} are:

$$S_{MS} = F_a S_s$$
$$S_{M1} = F_v S_1$$

where:

F_a = Site coefficient defined in Table 1615.1.2(1).

F_v = Site coefficient defined in Table 1615.1.2(2).

S_S = The mapped spectral accelerations for short periods as determined in Section 1615.1.

S_1 = The mapped spectral accelerations for a one second period as determined in Section 1615.1.

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Design Earthquake

Five-percent damped, *Design* spectral response accelerations are:

$$S_{DS} = 2/3\ S_{MS} \quad \text{(Equation 16-40)}$$
$$S_{D1} = 2/3\ S_{M1} \quad \text{(Equation 16-41)}$$

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Seismic Design Category (1)

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TABLE 1616.3(1)
SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD RESPONSE ACCELERATIONS

VALUE OF S_{DS}	SEISMIC USE GROUP		
	I	II	III
$S_{DS} < 0.167g$	A	A	A
$0.167g \leq S_{DS} < 0.33g$	B	B	C
$0.33g \leq S_{DS} < 0.50g$	C	C	D
$0.50g \leq S_{DS}$	D[a]	D[a]	D[a]

a. Seismic Use Group I and II structures located on sites with mapped maximum considered earthquake spectral response acceleration at 1-second period, S_1, equal to or greater than 0.75g, shall be assigned to Seismic Design Category E, and Seismic Use Group III structures located on such sites shall be assigned to Seismic Design Category F.

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Seismic Design Category (2)

TABLE 1616.3(2)
SEISMIC DESIGN CATEGORY BASED ON
1-SECOND PERIOD RESPONSE ACCELERATION

VALUE OF S_{DI}	SEISMIC USE GROUP		
	I	II	III
$S_{DI} < 0.067g$	A	A	A
$0.067g \leq S_{DI} < 0.133g$	B	B	C
$0.133g \leq S_{DI} < 0.20g$	C	C	D
$0.20g \leq S_{DI}$	D[a]	D[a]	D[a]

a. Seismic Use Group I and II structures located on sites with mapped maximum considered earthquake spectral response acceleration at 1-second period, S_1, equal to or greater than 0.75g, shall be assigned to Seismic Design Category E, and Seismic Use Group III structures located on such sites shall be assigned to Seismic Design Category F.

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Amplification & Response Modification Factors

MECHANICAL AND ELECTRICAL COMPONENTS SEISMIC COEFFICIENTS

Mechanical and Electrical Component or Element[b]	a_p[a]	R_p
General Mechanical Equipment		
Boilers and furnaces	1.0	2.5
Pressure vessels on skirts and free-standing	2.5	2.5
stacks	2.5	2.5
Cantilevered chimneys	2.5	2.5
Other	1.0	2.5
Manufacturing and Process Machinery		
General	1.0	2.5
Conveyors (non-personnel)	2.5	2.5
Piping Systems		
High deformability elements and attachments	1.0	3.5
Limited deformability elements and attachments	1.0	2.5
Low deformability elements and attachments	1.0	1.5
HVAC Systems		
Vibration isolated	2.5	2.5
Nonvibration isolated	1.0	2.5
Mounted in-line with ductwork	1.0	2.5
Other	1.0	2.5
Elevator Components	1.0	2.5
Escalator Components	1.0	2.5

ASCE 7

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Seismic Force

Seismic forces shall be determined by:

$$F_P = \frac{0.4\, a_p S_{DS} W_p}{R_p/I_p}(1+2z/h) \qquad \text{(Equation 9.6.1.3-1)}$$

F_p is not required to be taken as greater than:

$$F_p = 1.6 S_{DS} I_p W_p \qquad \text{(Equation 9.6.1.3-2)}$$

F_p shall not be taken as less :

$$F_p = 0.3 S_{DS} I_p W_p \qquad \text{(Equation 9.6.1.3-3)}$$

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Seismic Force

Where:

F_P = seismic design force
a_p = component amplification factor (from ASCE Table 9.6.3.2)
S_{DS} = seismic acceleration (determined previously)
W_p = component operating weight
R_p = component response modification factor (from ASCE Table 9.6.3.2)
I_p = component importance factor (user selected, either 1.0 or 1.5)
z = height in structure of point of attachment of component w.r.t.b.
h = average roof height of structure w.r.t.b.

ASCE 7

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Effect of Amplification & Response Factors

Seismic forces are:

$$F_P = \frac{I_p \, 0.4 \, a_p S_{DS} W_p}{R_p} (1+2z/h)$$

MECHANICAL AND ELECTRICAL COMPONENTS SEISMIC COEFFICIENTS

Mechanical and Electrical Component or Element[b]	a_p[a]	R_p
General Mechanical Equipment		
Boilers and furnaces	1.0	2.5
Pressure vessels on skirts and free-standing	2.5	2.5
stacks	2.5	2.5
Cantilevered chimneys	2.5	2.5
Other	1.0	2.5
Manufacturing and Process Machinery		
General	1.0	2.5
Conveyors (non-personnel)	2.5	2.5
Piping Systems		
High deformability elements and attachments	1.0	3.5
Limited deformability elements and attachments	1.0	2.5
Low deformability elements and attachments	1.0	1.5
HVAC Systems		
Vibration isolated	2.5	2.5
Nonvibration isolated	1.0	2.5
Mounted in-line with ductwork	1.0	2.5
Other	1.0	2.5
Elevator Components	1.0	2.5
Escalator Components	1.0	2.5

Amplification & Response Modification Factors

- Lower values for a_p shall not be used unless justified by detailed dynamic analyses. The value for a_p shall not be less than 1.0. The value of a_p=1 is for equipment generally regarded as rigid or rigidly attached. The value of a_p=2.5 is for equipment generally regarded as flexible or flexibly attached.

- Components mounted on vibration isolation systems shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as ***2***F_p if the maximum clearance (air gap) between the equipment support frame and restraint is greater than 1/4 in. If the maximum clearance is specified on the construction documents to be not greater than 1/4 in., the design force may be taken as F_p.

ASCE 7

What's Required?

- All architectural, mechanical, electrical, and other nonstructural components in structures shall be designed and constructed to resist the equivalent static forces and displacements determined in accordance with ASCE 7 Section 9.6. The design and evaluation of support structures and architectural components and equipment shall consider their flexibility as well as their strength.

ASCE 7

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Seismic Protection Exemptions

Exemptions are:

All components in Seismic Design Category A.

Mechanical components in Seismic Design Category B.

Mechanical components in structures assigned to Seismic Design Category C provided that the importance factor ***(I_p)*** is equal to 1.0.

Exemptions, cont'd

- Mechanical components in Seismic Design Categories D, E, and F where I_p = 1.0 and flexible connections between the components and associated ductwork, piping, and conduit are provided and that are mounted at 4 ft or less above a floor level and weigh 400 lb or less.

- Mechanical components in Seismic Design Categories D, E, and F weighing 20 lb or less where I_p = 1.0 and flexible connections between the components and associated ductwork, piping, and conduit are provided, or for distribution systems, weighing *5* lb/ft or less.

Supports & Restraints

- Support & restraint types include foundation and housekeeping pads, anchor bolts, structural members, braces, frames, skirts, legs, saddles, pedestals, cables, guys, stays, snubbers, and tethers, as well as elements forged or cast as a part of the mechanical equipment. If standard or proprietary supports are used, they shall be designed by either load testing or for the calculated seismic forces.

- Three analyses must be performed:
  – Attachment of the equipment to the restraint
  – Restraint design
  – Attachment of the restraint to the substructure

Piping

- *When forces and displacements from ASCE 7 are used:*
- Piping and support systems designed & installed in accordance with ASME B31 or NFPA 13 are deemed to meet the requirements of the Code.
- Piping not designed as above but with an I_p *of 1.5* has restrictions based upon material ductility and construction techniques, and must be investigated to ensure adequate flexibility, and to ensure that harmful interactions do not exist with it and any other piping, conduit, ductwork, equipment, or structure.

Pipe Supports

- **Piping not designed as above shall have supports constructed suitable for the application and in accordance with a nationally recognized structural code.**
- **Attachments embedded in concrete shall be suitable for cyclic loads.**
- **Rod hangers cannot be used as seismic supports unless 12" or less, and must not be subject to bending moments.**
- **Seismic supports shall be constructed so that support engagement is maintained.**

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Pipe Supports, cont'd

- **Seismic supports are not required for:**
  - **Ductile piping in Seismic Design Categories D, E, or F with an I_p=1.5 and 1" or smaller when protected from interactions with other piping, conduit, ductwork, equipment, or structure.**
  - **Ductile piping in Seismic Design Category C with an I_p=1.5 and 2" or smaller when protected from interactions with other piping, conduit, ductwork, equipment, or structure.**
  - **Ductile piping in Seismic Design Category D, E, or F designated as having an I_p= 1.0 and a nominal pipe size of 3" or smaller.**
  - **Ductile piping in Seismic Design Category A, B, or C designated as having an I_p= 1.0 and a nominal pipe size of 6" or less.**

Ductwork

- **In addition to their attachments and supports, ductwork systems designated as having an I_p = 1.5 themselves shall be designed to meet the force and displacement provisions of ASCE 7.**
- **Where HVAC ductwork runs between structures that could displace relative to one another and for seismically isolated structures where the HVAC ductwork crosses the seismic isolation interface, the HVAC ductwork shall be designed to accommodate the seismic relative displacements.**
- **Seismic restraints are not required for HVAC ducts with I_p of 1.0 if either of the following conditions are met:**
  - **HVAC ducts are suspended from hangers 12" or less in length from the top of the duct to the supporting structure. The hangers shall be detailed to avoid significant bending of the hangers and their attachments,**

    or
  - **HVAC ducts have a cross-sectional area of less than 6 square feet.**

Ductwork

- **HVAC duct systems fabricated and installed in accordance with standards approved by the authority having jurisdiction shall be deemed to meet the lateral bracing requirements.**
- **Equipment items installed in-line with the duct system (e.g., fans, heat exchangers, and humidifiers) weighing more than 75 lb (344 N) shall be supported and laterally braced independent of the duct system and shall meet the force requirements ASCE 7.**
- **Appurtenances such as dampers, louvers, and diffusers shall be positively attached with mechanical fasteners.**
- **Unbraced piping attached to in-line equipment shall be provided with adequate flexibility to accommodate differential displacements.**

Boilers

- **In addition to their attachments and supports, boilers and pressure vessels designated as having an I_p = 1.5 shall be designed to meet the force and displacement provisions of ASCE 7.**

- **The seismic design of a boiler or pressure vessel shall include analysis of the following: the dynamic effects of the boiler or pressure vessel, its contents, and its supports; sloshing of liquid contents; loads from attached components such as piping; and the interaction between the boiler or pressure vessel and its support.**

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Boilers

- **<u>When forces and displacements from ASCE 7 are used:</u>**

- **Boilers or pressure vessels designed in accordance with the ASME Boiler and Pressure Vessel Code shall be deemed to meet the force, displacement, and other requirements of ASCE 7.**

- **Boilers or pressure vessels not designed as above but with an I_p of 1.5 have restrictions based upon material ductility and construction techniques, and must be investigated to ensure adequate flexibility, and to ensure that harmful interactions do not exist with it and any other piping, conduit, ductwork, equipment, or structure.**

Other Equipment

- **Forces and displacements from ASCE 7 must be used in the design and installation.**
- **Equipment Manufacturers must certify that their equipment is designed to withstand the design earthquake forces.**

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Other Code Requirements

Depending on Seismic Design Category:

Increasing severity of *Seismic Design Categories* requires all design documents to be stamped by a Registered Design Professional.

- **Increasing severity of Seismic Design Categories requires ongoing inspections by a Registered Design Professional or otherwise qualified inspector during and after construction of the project.**

- **Increasing severity of Seismic Design Categories requires periodic inspections by a qualified inspector after construction.**

Design Resources Available

- **ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers - Handbook, 2003 General Applications, Chapter 54 - Seismic and Wind Restraint Design**
- **MSS – Manufacturers Standardization Society – Bracing for Piping Systems – Seismic – Wind – Dynamic Design, Selection, Application**
- **SMACNA - Sheet Metal and Air Conditioning Contractors National Association - Seismic Restraint Manual Guidelines for Mechanical Systems - Second Edition**
- **VISCMA – Vibration Isolation and Seismic Control Manufacturers Association – FEMA 412 – Installing Seismic Restraints for Mechanical Equipment & FEMA 414 - Installing Seismic Restraints for Duct and Pipe**

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ASHRAE Handbook

- **Summary and discussion of seismic design requirements**
- **Example calculations**
- **Discussion on proper application of different seismic restraint types**

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MSS Seismic Restraint Manual

- **Good piping support reference**
- **Standard hanger and bracing details and their load capacities**
- **Load ratings for bolting, expansion bolts, concrete embedded bolts, wire rope and other bracing members**

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SMACNA Seismic Restraint Manual

- **Good ductwork *<u>and</u>* piping support reference**
- **Standard hanger and bracing details and their load capacities**
- **Load ratings for bolting, expansion bolts, concrete embedded bolts, wire rope and other bracing members**

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VISCMA – Equipment, Duct, & Piping Restraints

FEMA 412 – Installing Seismic Restraints for Mechanical Equipment
FEMA 414 - Installing Seismic Restraints for Duct and Pipe

- **Cookbook approach as a designer's guide, as well as, installation manual with graphical illustrations and installation instructions.**
- **Covers all types of Mechanical Equipment installations, as well as all types of piping and ductwork hangers.**

Useful References

- ASHRAE – American Society of Heating, Refrigeration, Air-Conditioning Engineers – www.ashrae.org
- EERI – Earthquake Engineering Research Institute – www.eeri.org
- FEMA – Federal Emergency Management Agency – www.fema.gov/hazards/earthquakes
- NFPA – National Fire Protection Association – www.nfpa.org

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QUESTIONS?

Background

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US Army Corps
of Engineers
Omaha District

Electrical Infrastructure in Iraq- Restore Iraqi Electricity

Joseph Swiniarski

Electrical Engineer,

Omaha District

U.S. Army Corps of Engineers

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Agenda

- Prewar Electrical Infrastructure
- War Damages
- Post War Electrical Infrastructure
- Summary
- Questions

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Prewar Electrical Infrastructure

- 33 Plants with 153 Generating Units
- 10,000 MW Imbedded Generating Capability
- 4,800 MW of Demand
- 4,200 MW of Generation at Peak Times

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Power Distribution

- 24 hours a day of power to Bagdad
- 6 to 8 hours a day of power to other parts of the country

War Damage

- Very little electrical infrastructure damage caused by American troops
- Strategic strikes to interrupt electricity
- Most damage caused by looting

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Downed Power Lines

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Post War Infrastructure

- Generating 5000 MW of power
- Providing 14 hours of electricity nation wide
- Demand has increased to 7,200 MW
- Goal to add 3,200 MW on grid by end of 2005

How Were MWs Added?

- Adding new generating units to the grid
- Repairing existing generating units
- Completing construction on new generating plants.

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Examples

- At Baiji added 180 MW using 8 portable units
- Completed commisioning of multiple fuel Units 1 and 2.
- Completed construction of multiple fuel units 3 and 4.

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Portable Generators at Baiji

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New Generator at Baiji

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Skid Mounted Gas Purification Unit

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Questions?

NON-HAZARDOUS CHEMICAL TREATMENTS FOR HEATING AND COOLING SYSTEMS

Vincent F. Hock and Susan A. Drozdz
U.S. Army Engineer Research and Development Center
Construction Engineering Research Laboratory

What Are "Green" Chemical Treatments?

- Reduce corrosion, biological growth and scale in heating and cooling plants with treatments that are
  - Less toxic
  - Not environmentally persistent
  - Not bioaccumulative
  - Biodegradable to nontoxic byproducts
  - Efficient in their manufacturing process
  - Delivered into the system when needed, in correct amount

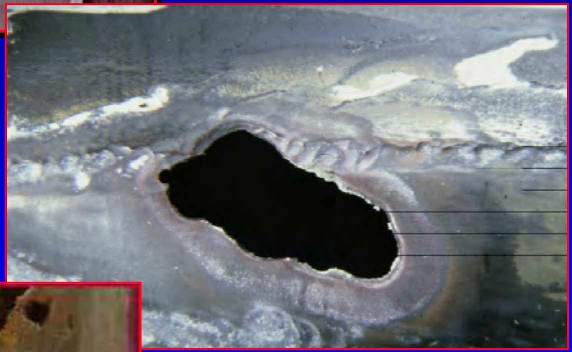
Heating and Cooling Impact on Mission

- Reliable operation of heating and cooling plants is critical to
  - Maintenance of mission-critical electronic equipment and computers
  - Training
  - Plant safety
  - Welfare of soldiers and their families

Background
Why is the effort needed?

- Lack of current and consistent guidelines for new water treatments
- Reduced system reliability and efficiency
- Premature failure of system components.

Poor control of acid feed strips galvanizing



Boiler Tube – Oxygen Pitting Failure

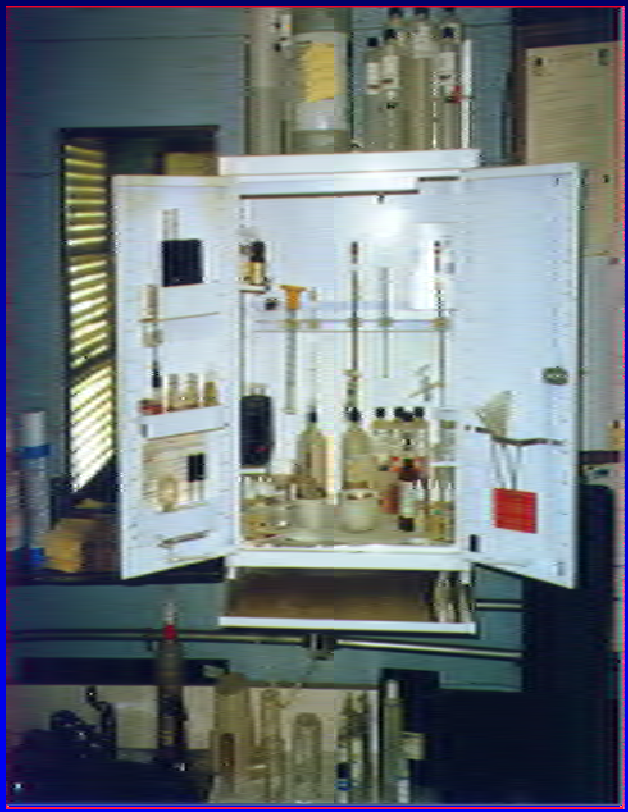
Boiler Feedwater Piping – 6 Months Deaerator Not Working Properly

Background
Why is the effort needed?

Current practice for chemical monitoring and control:

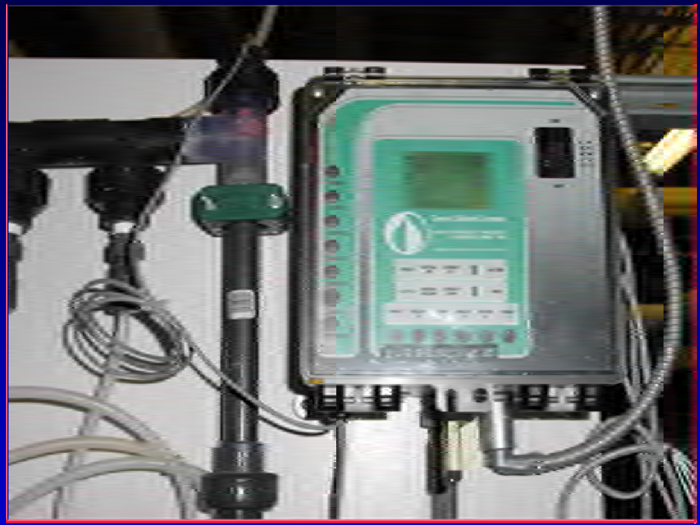
- is maintenance intensive
- requires a skilled technician
- requires direct contact with hazardous chemicals
- provides inconsistent dosing of chemicals and inconsistent levels of protection
- is costly

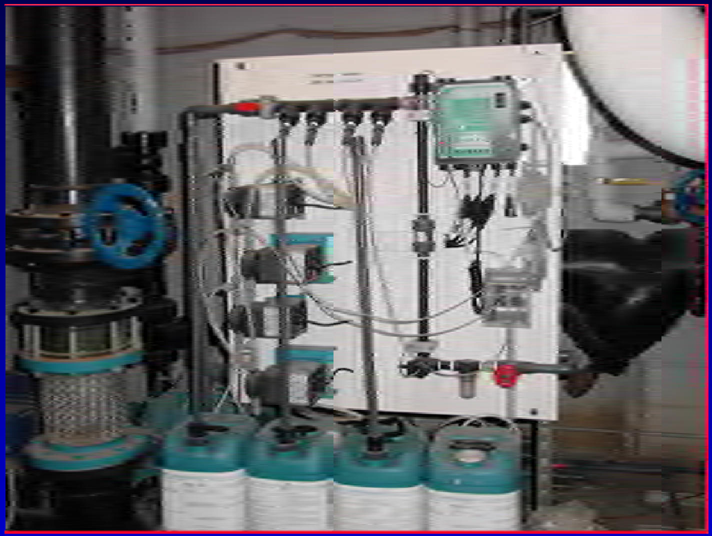
Background
Why is the effort needed?



Current Practices

Objective





Continuous monitoring and controlled dosage of environmentally friendly “green” chemicals

Technical Objectives

- Green Chemical formulations for corrosion and scale inhibitors and biocides.
- Smart monitoring and control systems for chemical dosing
- Improve reliability and security of heating and cooling systems
- Minimize the manpower and capital investment needed to operate heating and cooling systems
- Provide guidance to the field on use of green chemical treatments for heating and cooling systems

Technical Approach

- Pilot tests at three Army installations of
  - Scale inhibitor
  - Cooling tower biocide
  - Filming amine corrosion inhibitor
  - Automated monitoring and dosing system

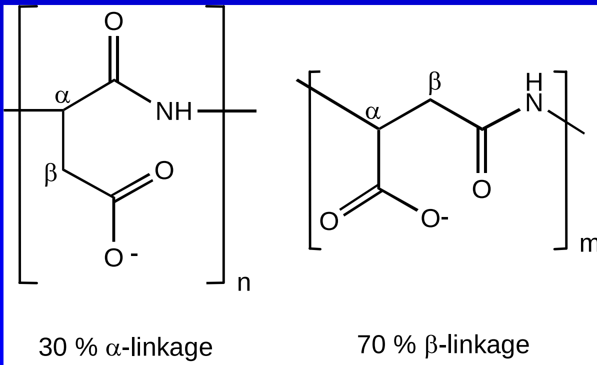
Green Chemical Formulations

Three Army installations were selected for pilot testing of environmentally friendly chemical treatments:

– polyaspartate (PASP) scale inhibitor
– tetrakis (hydroxymethyl) phosphonium sulfate (THPS) biocide
– biodegradable filming amine corrosion inhibitor

Polyaspartate (PASP) Scale Inhibitor

- Polyaspartate (PASP) Scale Inhibitor
  – water-soluble dispersant
  – prevents formation of calcium carbonate, calcium sulfate and barium sulfate
  – can replace the environmentally persistent polyacrylates



Polyaspartate

Polyaspartate (PASP) Scale Inhibitor

- Developed for moderate hardness and alkalinity
- Biodegrades with bacterial action
- Has an efficient manufacturing process that is virtually waste-free
- Is formulated for use in open recirculating cooling systems

Polyaspartate (PASP) Scale Inhibitor

- PASP scale inhibitors were developed by Garratt-Callahan Company
  - Formula G-C 2600 for waters with moderate hardness and alkalinity
  - Formula G-C 2610 for waters of high hardness and high alkalinity
- Treatment dosage levels are 100 – 150 ppm
- Formulas also contained corrosion inhibitors and a molybdenum tracer to track dosage levels

Polyaspartate (PASP) Scale Inhibitor

- Results
  - PASP did not change the operating performance of the equipment
  - Product appears to have good dispersion qualities
  - Scale prevention on heat exchanger tubes was effective at both sites

Tetrakis (Hydroxymethyl) Phosphonium Sulfate (THPS)

- Broad spectrum, non-foaming, microbiocide
- Benign environmental toxicity profile
- Degrades rapidly upon discharge through hydrolysis, oxidation, photodegradation, and biodegradation.
- Stable and effective over a pH range of 3 - 10.
- Controls slime-forming bacteria and algae in recirculating water cooling systems, industrial process water systems and air scrubbers.
- May be used to control aerobic and anaerobic bacteria, especially sulfate reducing bacteria.

Bacteria Counts at Ft. Hood Cooling Tower

Date	Aerobic Bacteria	Anaerobic Bacteria
July 10	10^4	0
July 31	10^3	0
August 8	10^3	0
August 20	10^3	0
August 27	10^4	0
September 5	10^5	0
September 11	10^5	0
September 18	10^4	0
September 26	10^3	0
October 2	10^3	0
October 9	10^4	0
October 16	10^4	0
October 23	10^5	0
October 31	10^3	0
November 5	10^3	0
November 12	10^4	0
November 20	10^3	0
November 27	10^3	0

(Bacteria counts are less than 10^6 are considered excellent)

Tetrakis (hydroxymethyl) phosphonium sulfate (THPS)

- Results
  - Provided good aerobic and anaerobic bacteria control
  - Limited success with algae control
  - Will be most effective when alternated with an oxidizing biocide

Filming Amine Corrosion Inhibitor

- A filming inhibitor for the condensate systems made from exthoxalated soya products per specifications.
- Controls corrosion in steam condensate return systems by forming a thin, non-wettable, protective thin film barrier on metal surfaces.
- Garratt-Callahan Formula 4055

Filming Amine Corrosion Inhibitor

Benefits of Efficient Chemical Treatment

- Reduced maintenance needs
- Reduced outages/loss of service---critical!
- Green chemicals increase health and safety--- critical!
- Reduced water and chemical usage
- Extended equipment life
- Research shows that it works!

Summary

- "Smart" monitoring and dosing systems can aid in maintaining optimum conditions and eliminate overuse of chemicals
- PASP is a "greener" approach to reduce mineral scale
- THPS is effective in reducing bacteria, and can work with an oxidizing biocide to control algae
- Ethoxalated soya filming amines show promise as effective corrosion inhibitors

Vincent F. Hock

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217-373-6753 vincent.f.hock@erdc.usace.army.mil

Trane Government Systems & Services

Products, Solutions and Contracts for Federal Agencies

Federal Government Facilities Issues

- Deteriorating and Aging Infrastructure
- Insufficient Budget to Handle S/R/M
- Manpower Concerns- Outsourcing, Privatization
- Executive Orders and Laws Mandating Efficiency
- EPA mandates for CFC Elimination
- Energy Supply / Utility Concerns / Reliability
- Security Concerns - Mission and Facility Reliability

Recapitalizing Military Facilities

USAToday
November 6, 2001

USA's military bases turning into slums

Deteriorating housing and work facilities drain morale, waste millions

By Andrea Stone
USA TODAY

HUNTER ARMY AIRFIELD, Ga. – Chief Warrant Officer Butch Zirpolo's soldiers are proud to maintain the world's most advanced combat helicopter, the Longbow Apache. They just wish they didn't have to work in such a decrepit hangar.

The cavernous structure was built nearly 50 years ago for massive B-52 bombers. It has no insulation, the roof leaks and windows are missing. The light fixtures are so high that maintenance crews have to use flashlights to work at night. And rotor blades have been damaged repeatedly as the helicopters maneuver around motorized bay doors that keep breaking down. The rotors cost $100,000 to replace.

"They have better facilities in Bosnia," Zirpolo says. "A lot of soldiers feel anger."

Welcome to today's U.S. military, where rundown housing and ramshackle work facilities are common on bases across the country.

Troops are asked to put their lives on the line in service to the nation. Yet they often are forced to work in dilapidated surroundings: runways are crumbling, piers are rusting, roofs leak, sewer lines are corroded, headquarters are cramped.

And when soldiers who live on base go home to their families, they often have to put up with tenement-like barracks with peeling paint, cracked walls and poor plumbing. Many compare the housing to inner-city public housing projects.

"It's unconscionable," says Rep. Edward Schrock, R-Va., a member of the House Armed Services Committee. "We owe our service people better."

By Sandy Huffaker for USA TODAY

In disrepair: Marine Cpl. Nathan Ferbert walks up a dilapidated set of stairs in the Fort Horno section of Camp Pendleton, Calif.

Neglected

How the U.S. military rates the condition of its base facilities:

Good	9%
Fair	22%
Poor	51%
Very poor	18%

Source: Defense Department

USA TODAY

By Stephen Morton for USA TODAY

"Don't drink": The water in the restrooms and water fountains in this World War II-era office building at Fort Stewart, Ga., is contaminated.

Cover story

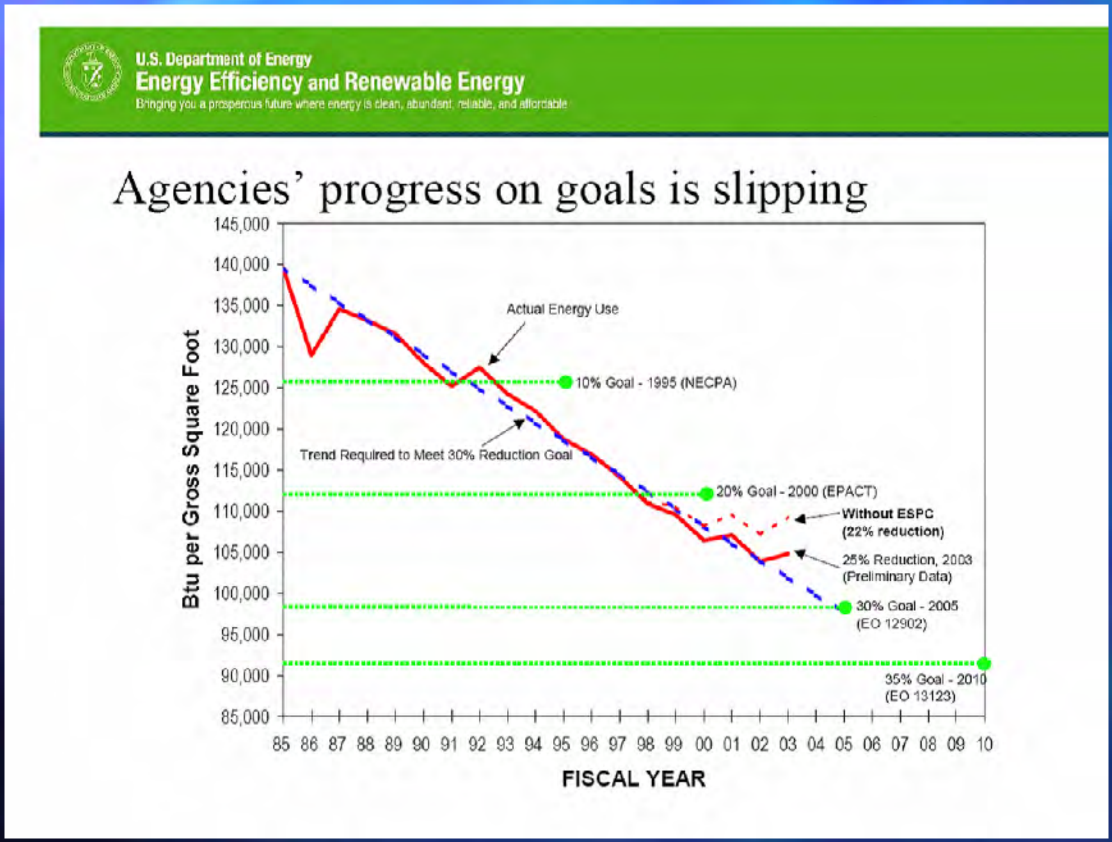
the dilapidated facilities by 2010. fense Department doesn't have

"The reason is simple: The Defense Department doesn't have the money. Based on its annual new construction budget of $3.9 billion, it would take 192 years to replace its outdated facilities - compared to 57 years in the private sector."

Progress Is Slipping

Fresh and Innovative Approaches Are Needed

Federal Agency Reduction in Facilities Energy Usage per SF



- * Product Innovations
- * New Technologies
- * Systems !!!
- * Innovative and Creative Applications
- * Facilities Integration and Controls
- * Comprehensive Contract Solutions
- * Identify and Evaluate Viability of all possible savings options

Trane Federal Systems & Services

- Federal Government Energy Conservation
  - Trane is an ESCO with an excellent record
  - ESPC - Energy Savings Performance Contracts
    - DOE Geothermal Super ESPC IDIQ Contract
    - GSA Schedule ESPC IDIQ Contract

Trane Federal Systems & Services

- Comprehensive Infrastructure Solutions
  - Turnkey Solutions Contracting
    - GSA Schedule 84 - Contract #: GS-07F-0248K
      - Trane HVAC Products, Systems, and Controls
      - Turnkey Installation
      - Project Financial Solutions
      - Open Market Items for complete solution
  - Coming Soon -- Facilities Management
    - GSA Schedule 03FAC
      - On-Site Facilities Management and Maintenance
      - HVAC Services, Maintenance, and Repair
      - Control Systems Service, Maintenance and Repair

Thank You For Attending Today

- Our Program here in St. Louis
  - Refrigerant Regulations and Implications for Products and Specifications
    - Mike Thompson, Director-Environmental Affairs

  Post Conference Workshop (Thursday 1-5pm)
  - Packaged Central Plants (New USACE ECB)
    - Trey Austin, TAS Inc (Trane Business Partner)
  - HVAC Dehumidification Strategies
    - John Murphy, Senior Applications Engineer
- Visit Trane Exhibit in the Conference Area
    - Robert Johnson, Director Institutional Markets
    - Mike Weise, Federal Segment Leader
    - Jeff Rud, Federal Programs Manager

Update on Environmental Legislation

Mike Thompson

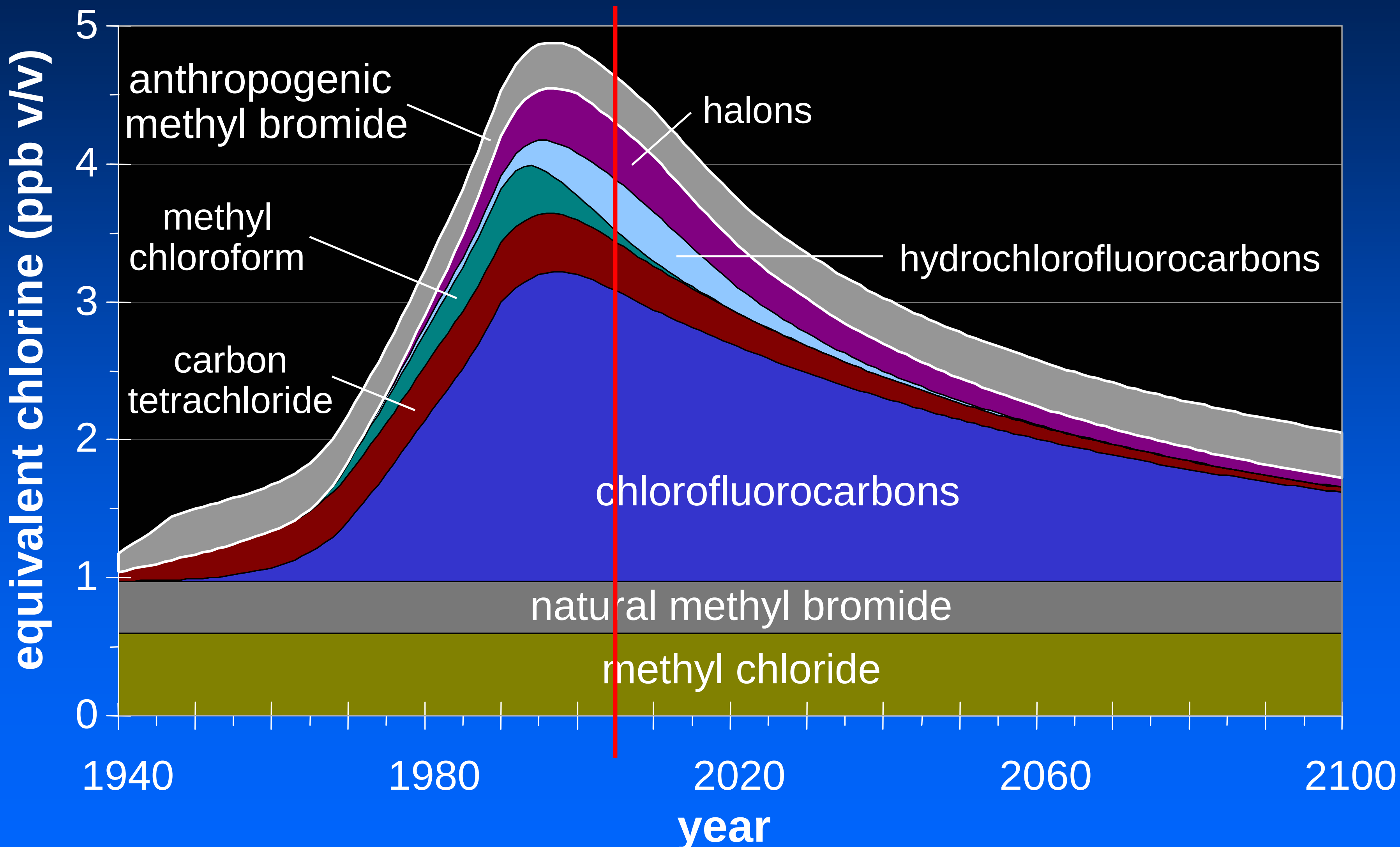
Director of Environmental Affairs

Trane

Agenda

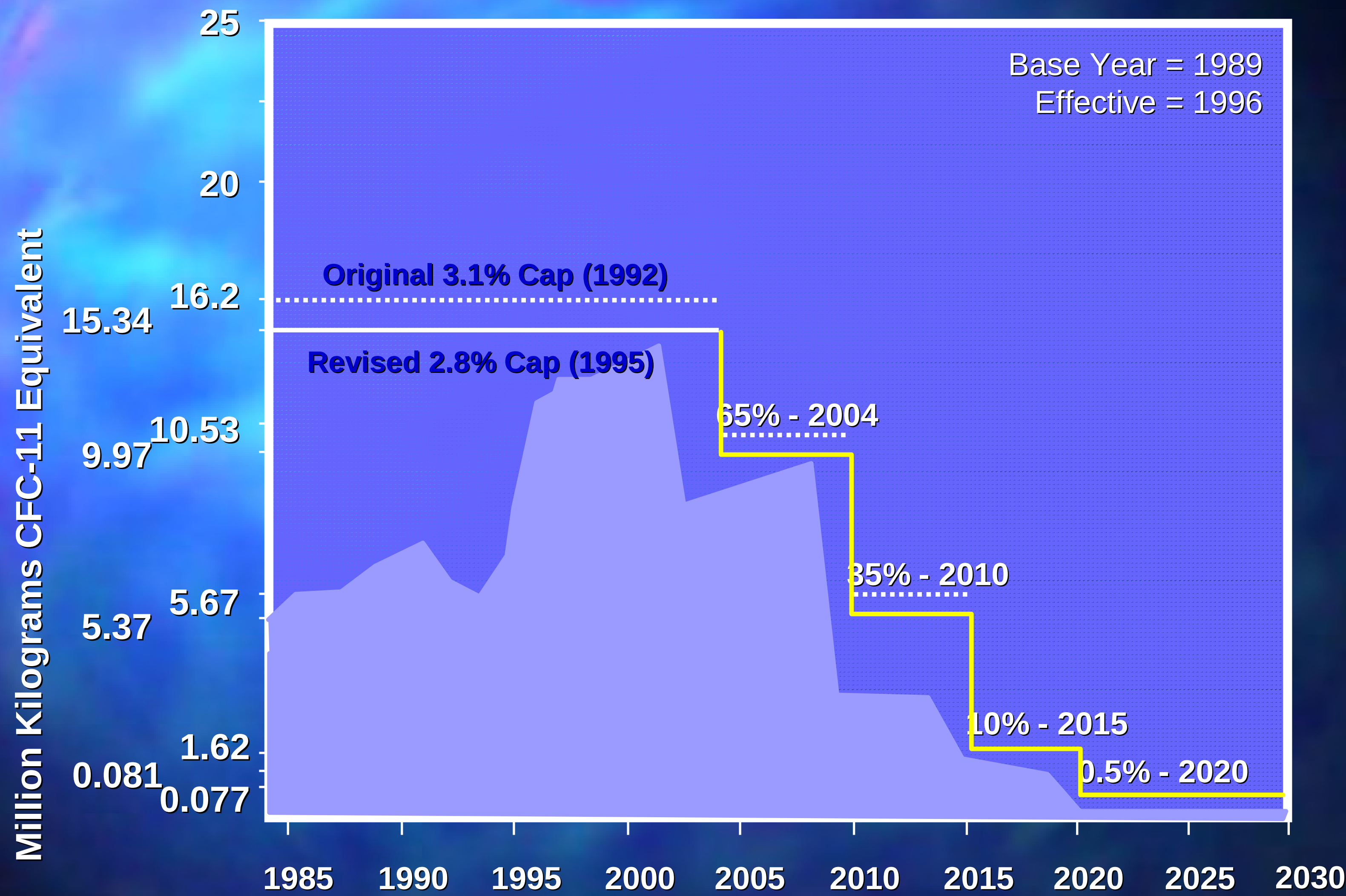
- The environmental story
- Refrigerants, Phase-outs, Alternatives
- Choosing the best overall refrigerant solution today
- What do the people outside the HVAC community say about refrigerant choice

Chlorine-Bromine Loading



D. J. Wuebbles and J. M. Calm, "An Environmental Rationale for Retention of Endangered Chemicals," *Science*, 278(5340):1090-1091, 7 November 1997

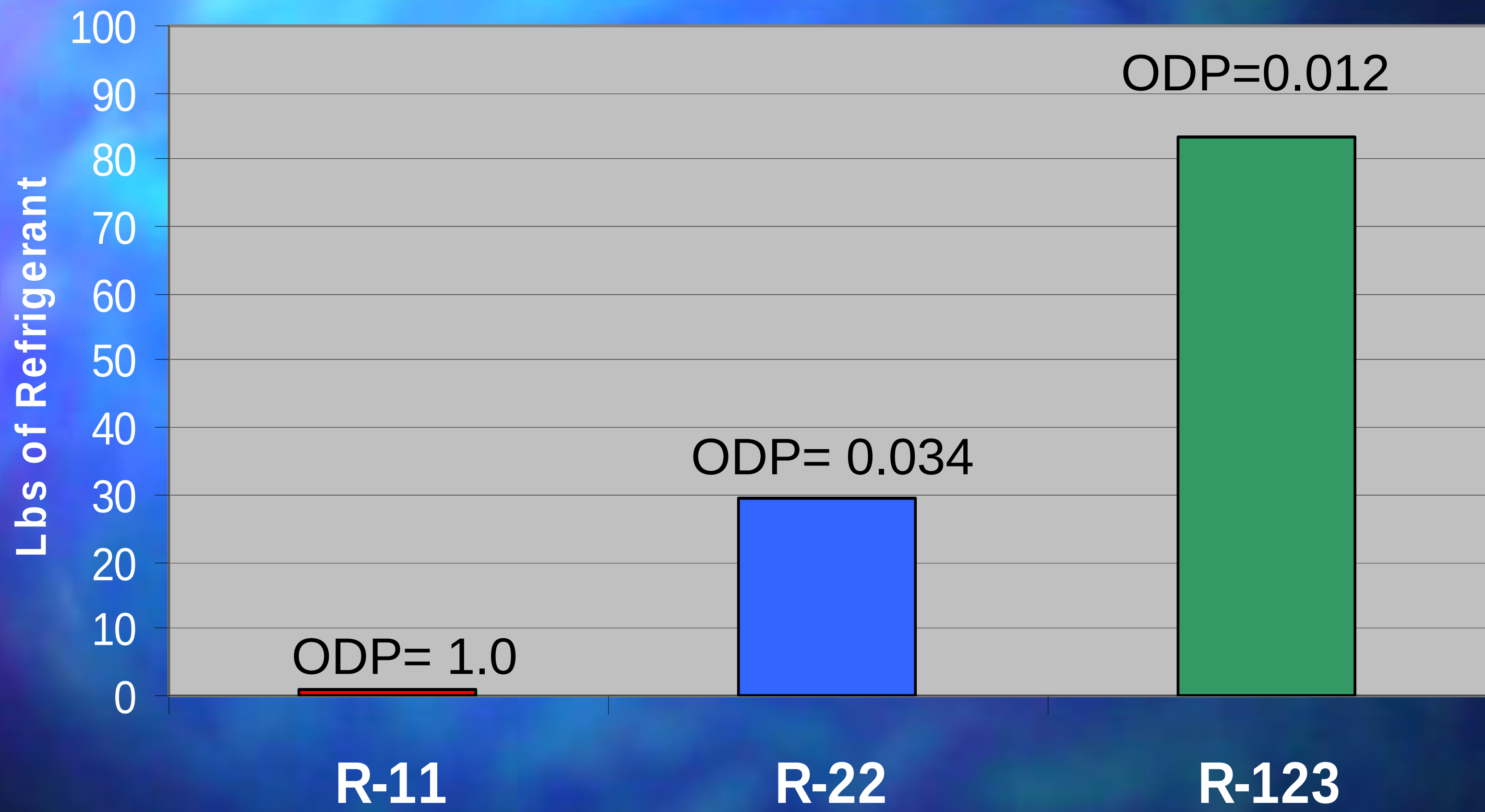
Weighted U.S. HCFC Use and Montreal Protocol HCFC Consumption Cap



CAP = 1989 CFC consumption x 2.8% plus 100% of 1989 HCFC consumption (ODP weighted basis)

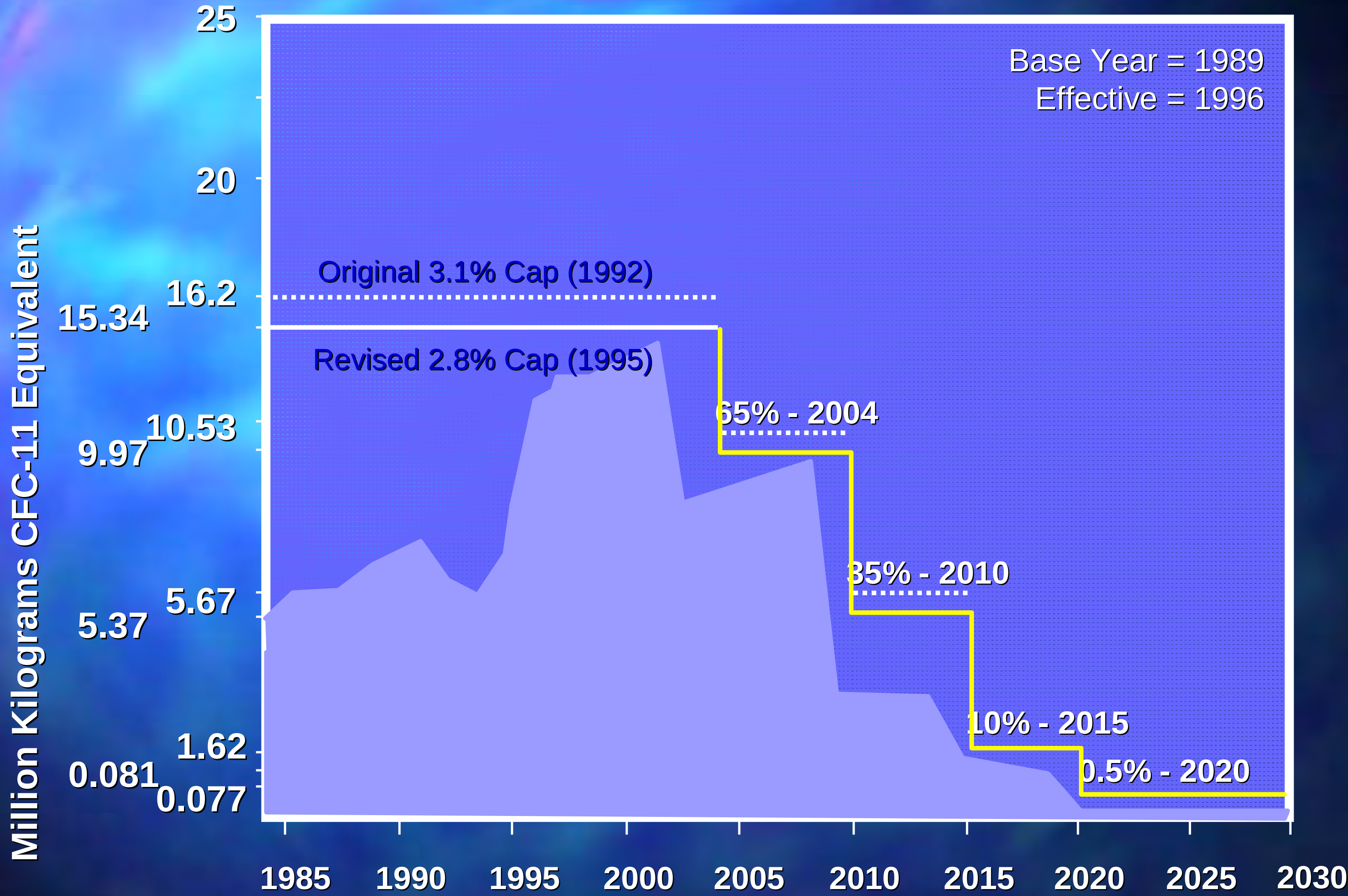
*0.5% of CAP from 2020 - 2030 only for service of existing refrigeration and air conditioning equipment

What Does Equivalent R-11 Mean?



1 lb R-11 → **29.4 lbs** R-22 → **83.3 lbs** R-123

Weighted U.S. HCFC Use and Montreal Protocol HCFC Consumption Cap



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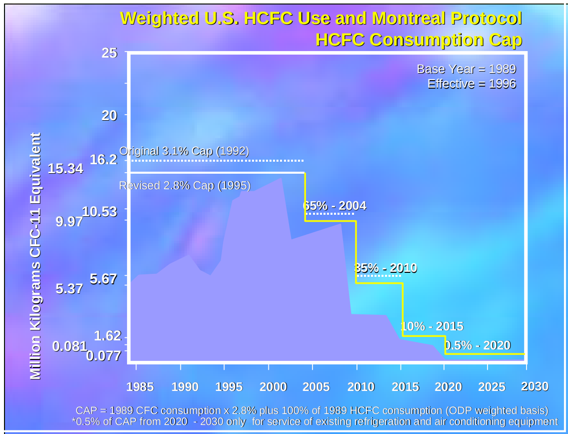
***0.5% of CAP from 2020 - 2030 only for service of existing refrigeration and air conditioning equipment**



Will There Be Enough Volume in the Future Under These Caps?

2020-2030- 0.5% of 1989 level of "equivalent" R-11

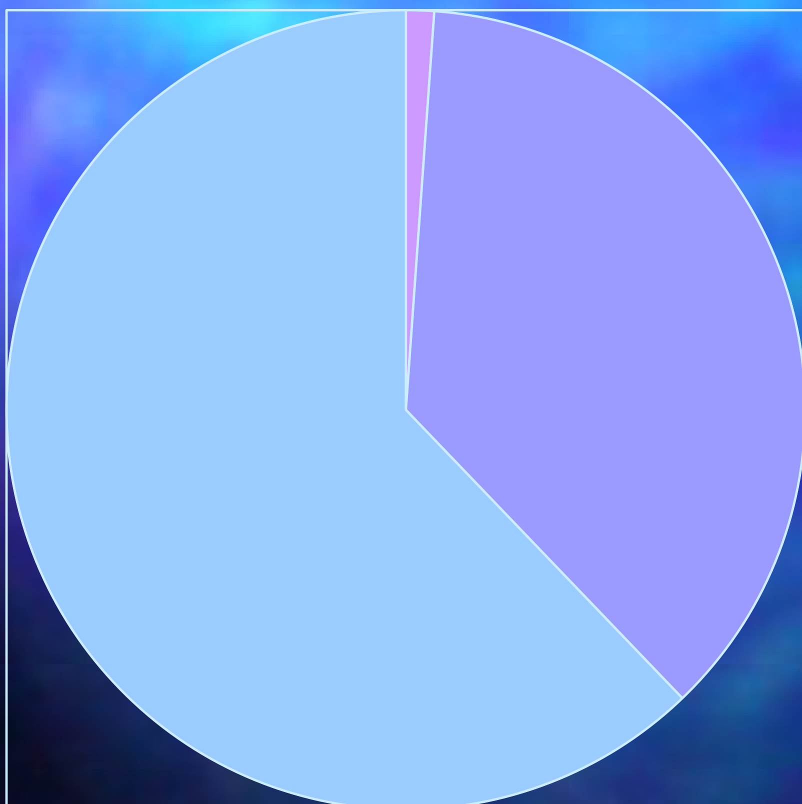
Assumptions: All chillers in US are R-123 (80,000 chillers)
Average chiller size: 500 tons
Refrigerant charge: 2 lbs/ton
Average charge/chiller: 1000 lbs

(80,000 chillers) x (1000 lbs/chiller) x (0.5% leakage rate/year) = 400,000 lbs/yr

0.5% cap from 1989 levels equates to 12,100,000 lbs/year of R-123

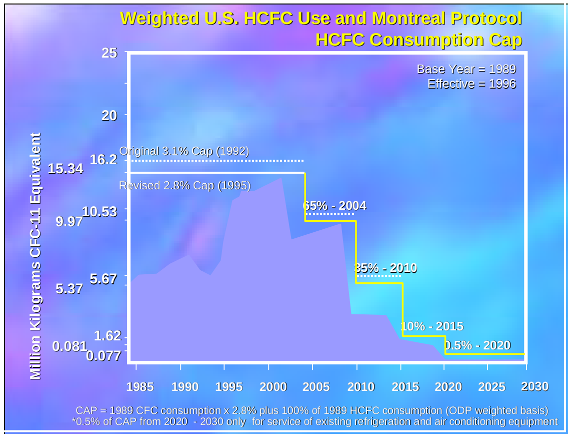
More than 30 times the needed volume can be produced!

How Does the 12,100,000 lbs Compare to Today's Usage?



1998 Total HCFC Production

- R-123- 4,000,000 lbs
- R-141b- 130,000,000 lbs
- R-22- 220,000,000 lbs



Will Refrigerant Manufactures Continue To Make The Refrigerant Up Until 2030?

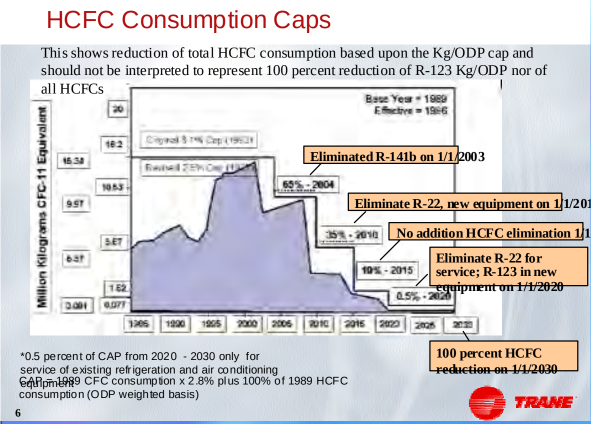
Yes- and Even Beyond 2030

HCFC's used as a feedstock chemical to make other chemicals (like HFC's) are not subject to the Montreal Protocol phaseout

R-123 is used as a feedstock to produce R-125
R-125 is 50% of the blend that makes R-410A
R-125 is 25% of the blend that makes R-407C

R-125 capacity will expand drastically in the coming years

Most facilities that produce R-125, will have the ability to co-produce R-123



Will There Be Enough R22 Volume in the Future Under These Caps?

2010-2020: Diversity and complexity associated with estimation process

Assumptions: EPA's estimates
No consensus update on projections

Logic: Production may be tight, but will continue
Re-use & reclamation makes up difference
Enormous feedstock potential for re-use & reclamation
CFC-11 Example: Readily available with no price escalation

Why will R22 production continue through 2019?

Availability: R-22 Production Will Continue

R-22

↓

Fluoropolymers

- Significant amount of world's R-22 production is used as a chemical intermediate (feedstock) to produce fluoropolymers (e.g. DuPont Teflon®)
- Fluoropolymer production will continue
- Feedstock use of R-22 is specifically excluded from control under the Montreal Protocol.
  - Reason: R-22 isn't released into atmosphere when used as a feedstock

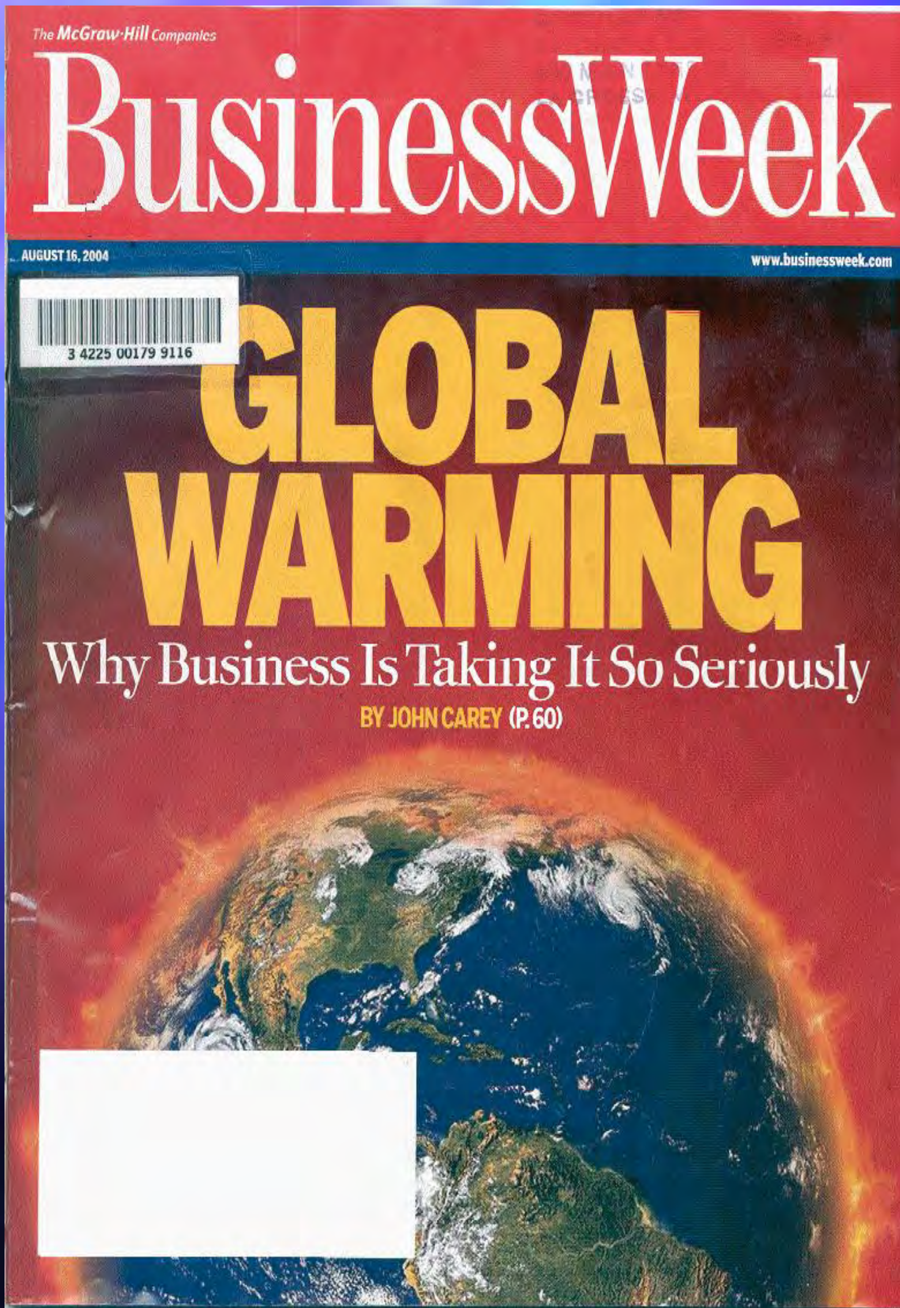
APRIL 1994

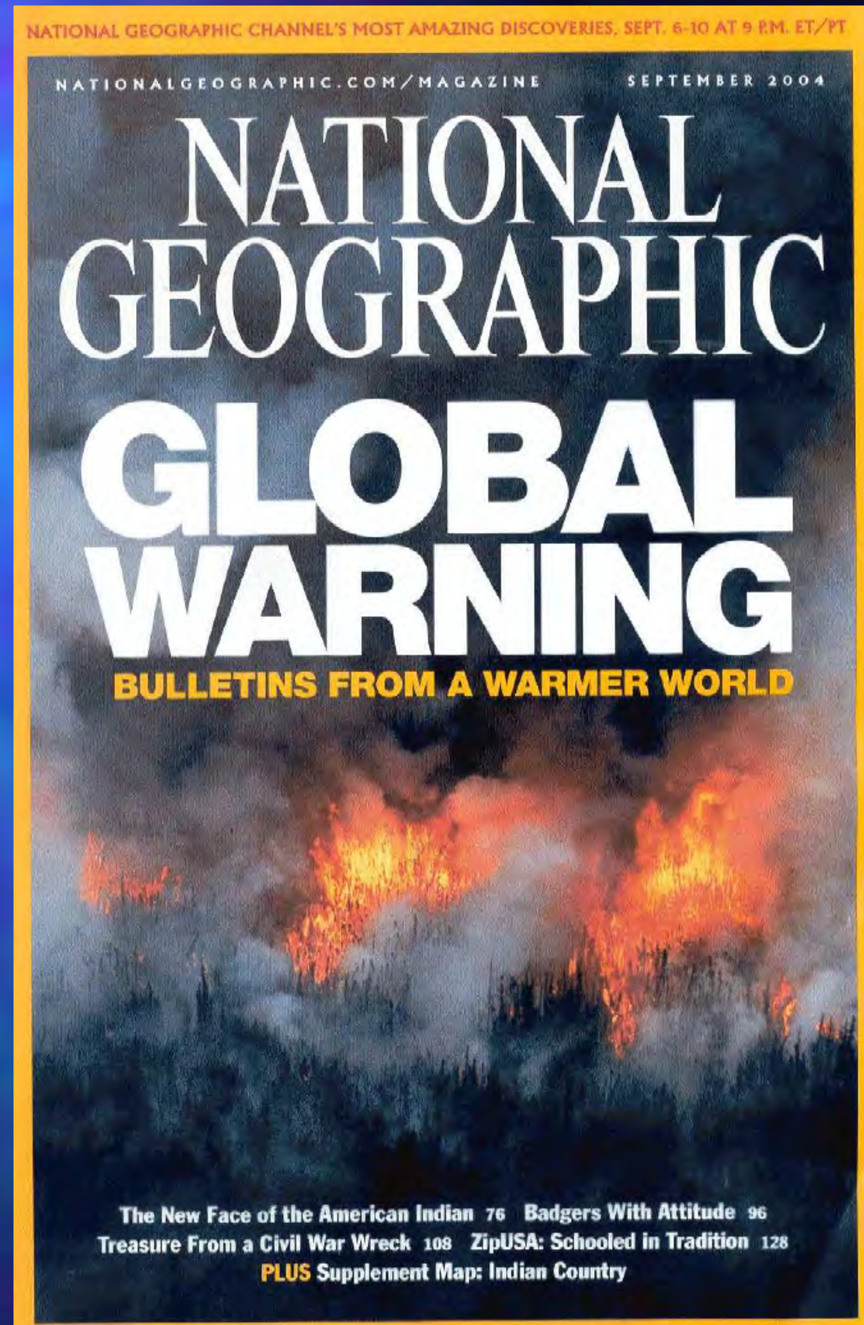
SECOND CLASS POSTAGE PAID

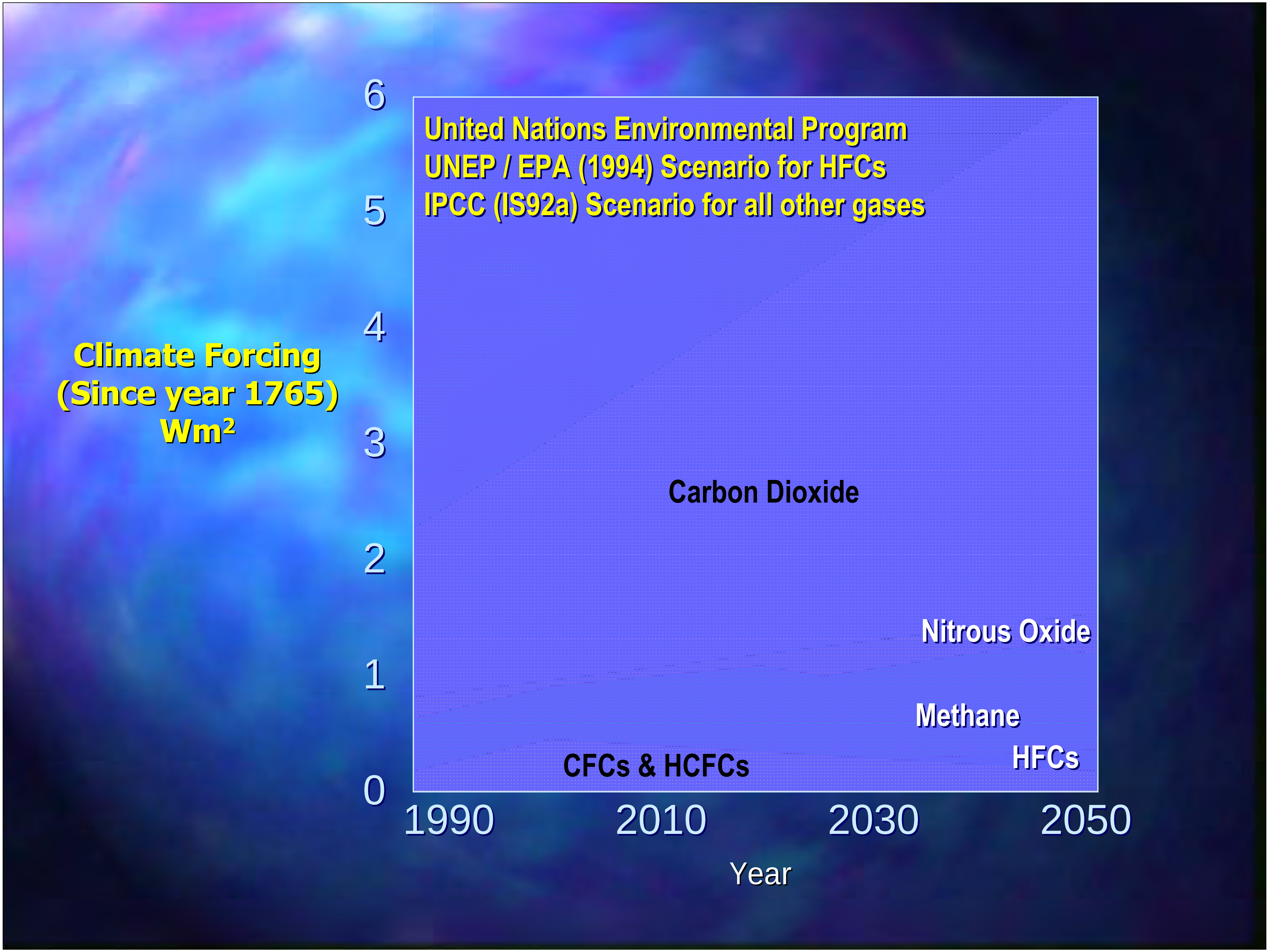
THE MAGAZINE OF MECHANICAL SYSTEMS ENGINEERING

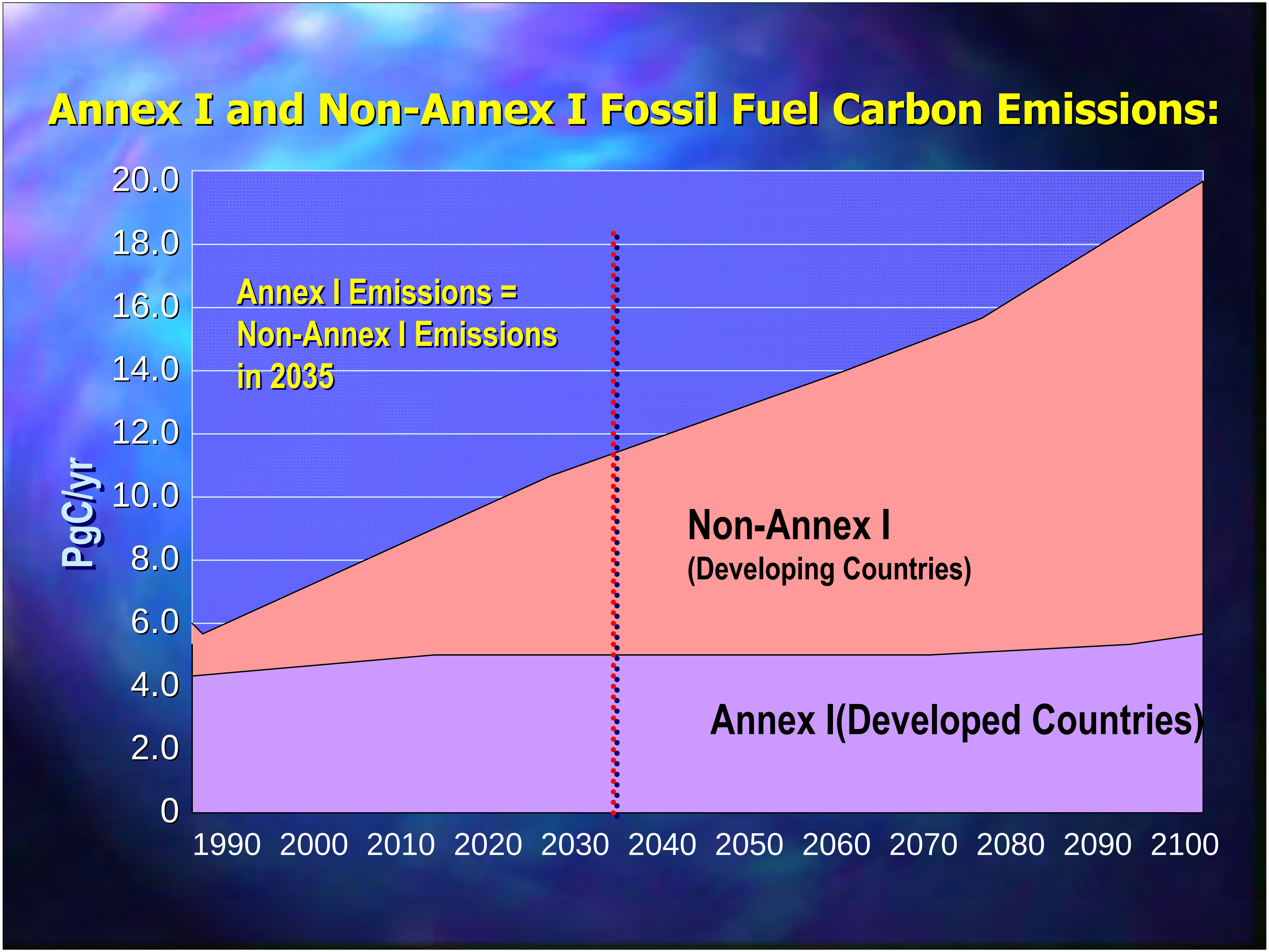
Heating Piping AirConditioning

REFRIGERANTS:
The Future In The Balance


The McGraw-Hill Companies
BusinessWeek
AUGUST 16, 2004
www.businessweek.com
3 4225 00179 9116
GLOBAL WARMING
Why Business Is Taking It So Seriously
BY JOHN CAREY (P. 60)

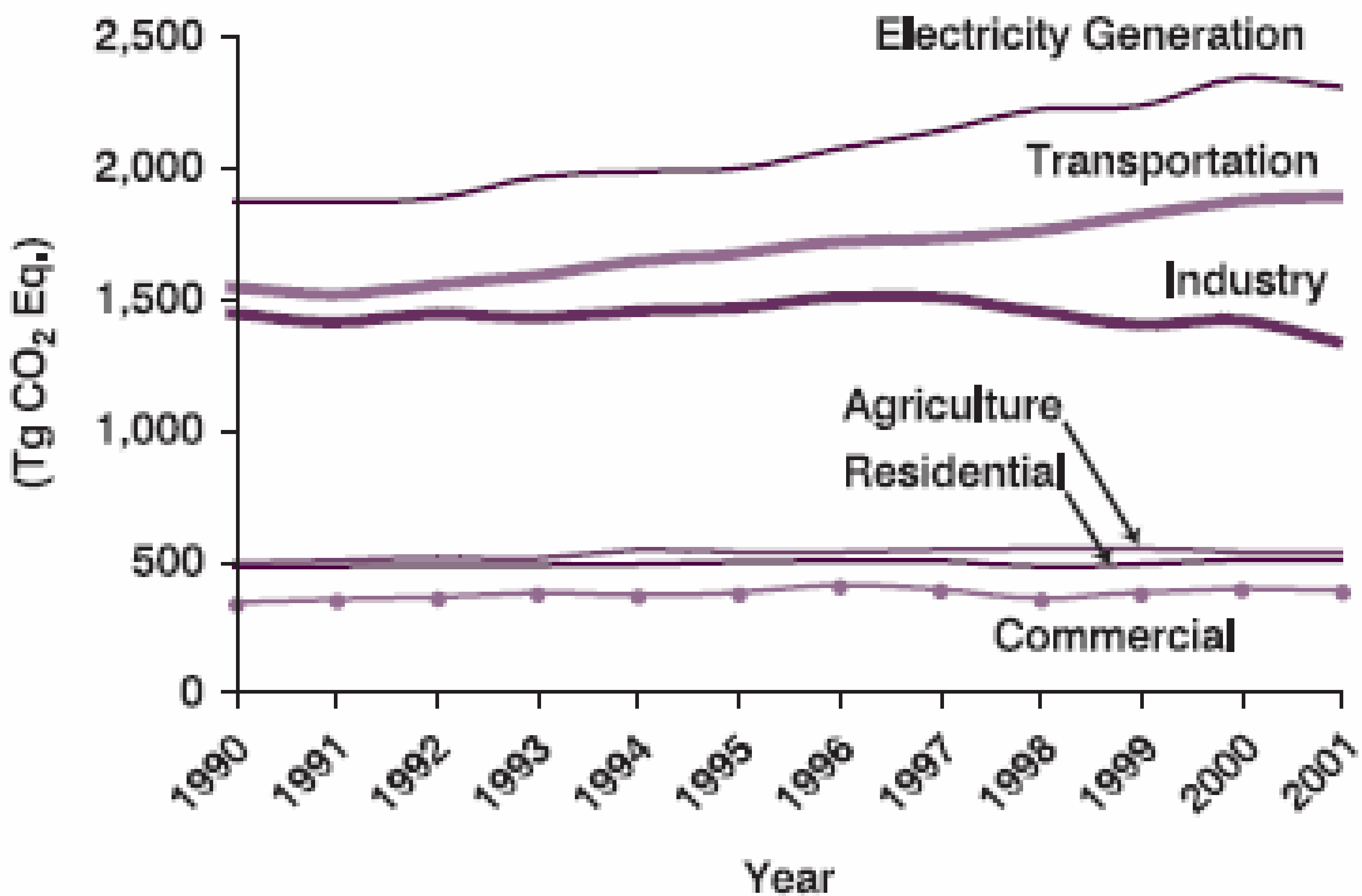

NATIONAL GEOGRAPHIC CHANNEL'S MOST AMAZING DISCOVERIES, SEPT. 6-10 AT 9 P.M. ET/PT
NATIONALGEOGRAPHIC.COM/MAGAZINE
SEPTEMBER 2004
NATIONAL GEOGRAPHIC
GLOBAL WARNING
BULLETINS FROM A WARMER WORLD
The New Face of the American Indian 76
Badgers With Attitude 96
Treasure From a Civil War Wreck 108
ZipUSA: Schooled in Tradition 128
PLUS Supplement Map: Indian Country


United Nations Environmental Program
UNEP / EPA (1994) Scenario for HFCs
IPCC (IS92a) Scenario for all other gases
Climate Forcing
(Since year 1765)
Wm2
6
5
4
3
2
1
0
Carbon Dioxide
Nitrous Oxide
Methane
HFCs
CFCs & HCFCs
1990
2010
2030
2050
Year



Annex I and Non-Annex I Fossil Fuel Carbon Emissions:
PgC/yr
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0
1990
2000
2010
2020
2030
2040
2050
2060
2070
2080
2090
2100
Annex I Emissions =
Non-Annex I Emissions
in 2035
Non-Annex I
(Developing Countries)
Annex I(Developed Countries)

Emissions Allocated to Economic Sectors



Note: Does not include U.S. territories

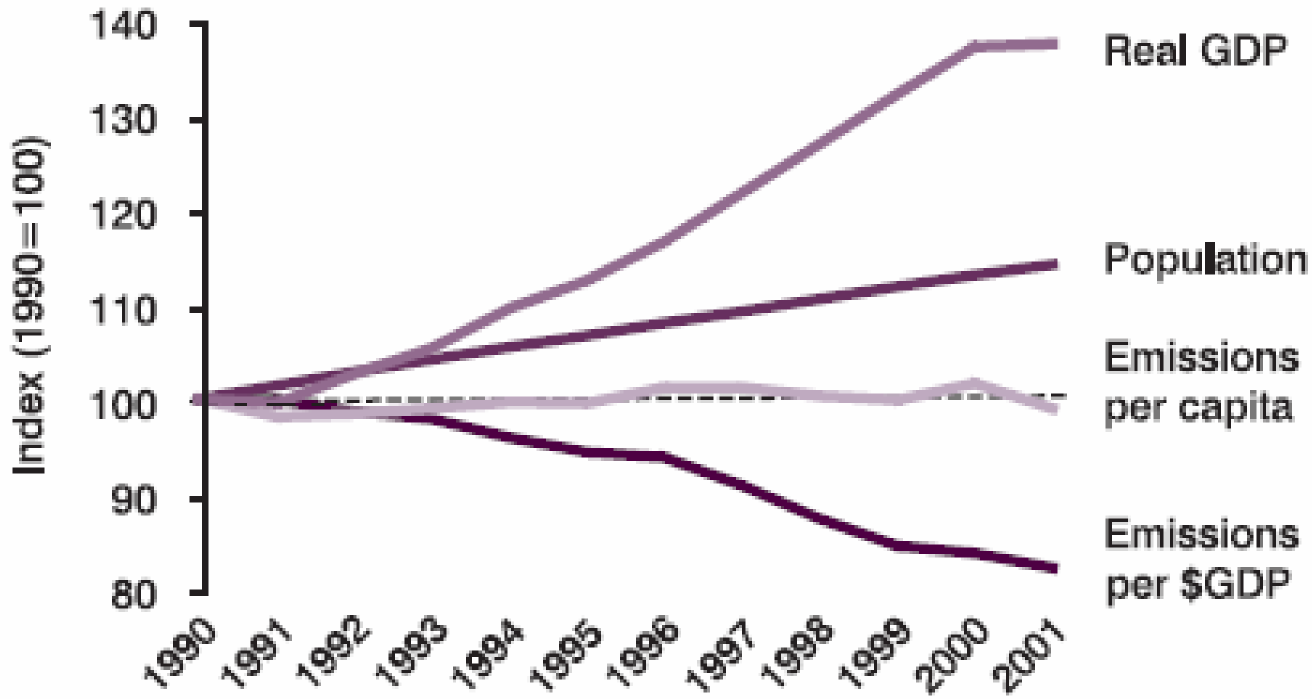
Kyoto Protocol Greenhouse Gas Coverage

- Six (6) Gases
  - Carbon Dioxide -- CO_2
  - Methane -- CH_4
  - Nitrous Oxide -- N_2O
  - Hydrofluorocarbons -- HFCs
  - Perfluorocarbons -- PFCs
  - Sulfur hexafluoride -- SF_6
- Base Period
  - 1990 for CO_2 , CH_4 , and N_2O
  - 1990 or 1995 for HFCs, PFCs, and SF_6

Kyoto Protocol -- Country Targets

Country	% of base	Country	% of base
Australia	108	Italy	92
Austria	92	Japan	94
Belgium	92	Lithuania	92
Bulgaria	92	Netherlands	92
Canada	94	New Zealand	100
Croatia	92	Norway	101
Czech Republic	92	Poland	94
Denmark	92	Portugal	92
Estonia	92	Romania	92
European Community	92	Russian Federation	100
Finland	92	Spain	92
France	92	Sweden	92
Germany	92	Switzerland	92
Greece	92	Ukraine	100
Hungary	94	United Kingdom	92
Iceland	110	United States	(93)

U.S. Greenhouse Gas Emissions Per Capita and Per Dollar of Gross Domestic Product



Source: BEA (2002), U.S. Census Bureau (2002), and emission estimates in this report

Denmark
HFC Phaseout Law

- General HFC Ban - 2006
- Cooling Plants, Heat Pumps & Air Conditioning Plants HFC Ban For Systems With 10kg or Higher - 2007
- Exempt from Ban
  - Cooling Plants, Heat Pumps & Air Conditioning Plants With 0.15 - 10kg.
  - Cooling Systems For Process Heat Recovery With Charge Less Than 50kg.

Austria
HFC Phaseout Law

- Appliance HFC Ban - 2008
- Air Conditioning and Mobile Refrigeration HFC Ban - 2008

Switzerland
HFC Phaseout Law

- Domestic Refrigeration HFC Ban - 2003
- Air Conditioners HFC Ban - 2005
- Mobile Air Conditioning HFC Ban - 2008

European Union
Draft HFC Regulation

- Containment of HFCs
  - Prevent and minimize leakage
  - Mandatory inspections
  - Leakage detection systems
  - Maintenance of records
- Recovery of HFCs
- Training and Certification
- Automobile HFC-134a Ban
  - No new vehicles with HFCs - GWP greater than 150 in 2012
  - Prohibit sale of vehicles with HFCs greater than 150 in 2018

The latest assessment report from the Refrigeration, A/C and Heat Pumps Technical Options Committee (RTOC), contains a great quote. The assessment is part of the United Nations Environment Programme (UNEP) review pursuant to Article 6 of the Montreal Protocol.

"8.4.2.7 Environmental Evaluation for Retention of HCFC-123 as a Refrigerant for Centrifugal Chillers

Refrigerant HCFC-123 has a favorable overall impact on the environment that is attributable to five factors:

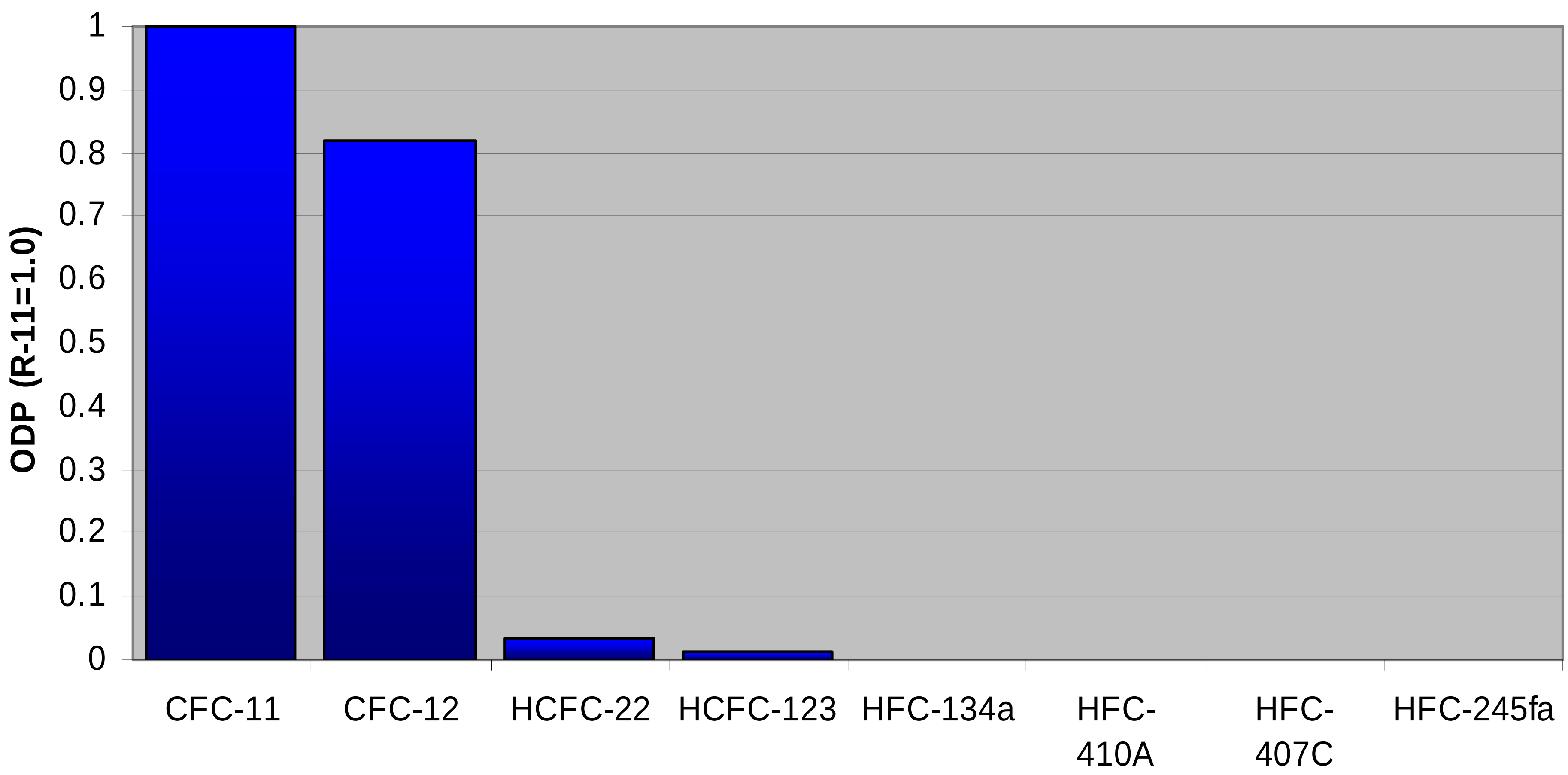
(1) a low ODP
(2) a very low GWP
(3) a very short atmospheric lifetime
(4) the extremely low emissions of current designs for HCFC-123 chillers
(5) the highest efficiency of all current options

Based on integrated assessments, considering the tradeoffs between negligible impacts on stratospheric ozone and important benefits in addressing global warming, these studies recommend consideration of a phase-out exemption for HCFC-123."

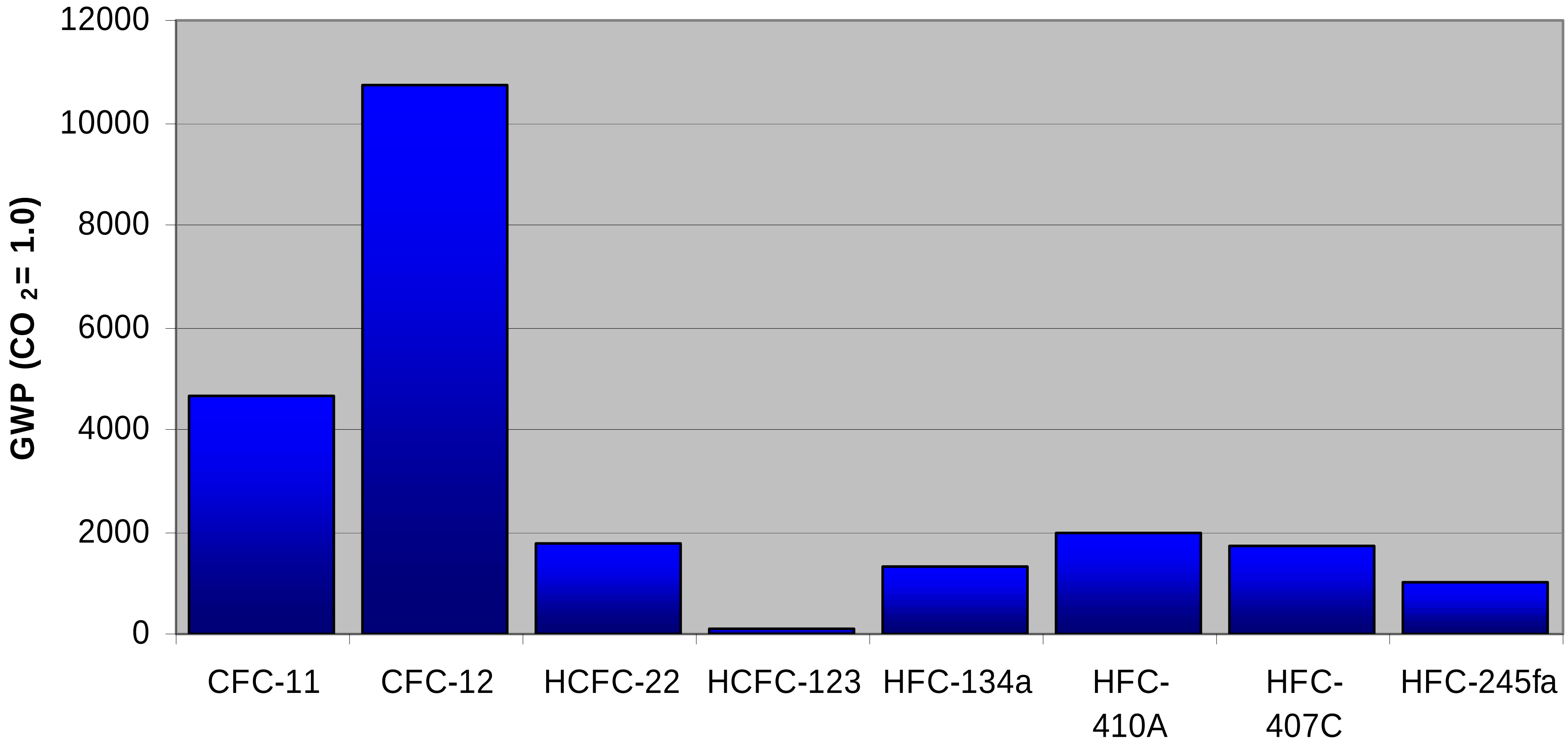
The Best Environmental Solution

1. Low ODP (Ozone Depletion Potential)
2. Low GWP (Global Warming Potential)
3. High operating efficiency
4. Short atmospheric life
5. Low toxicity
6. Low operating pressure
7. Low flammability
8. Good cost Vs efficiency relationship

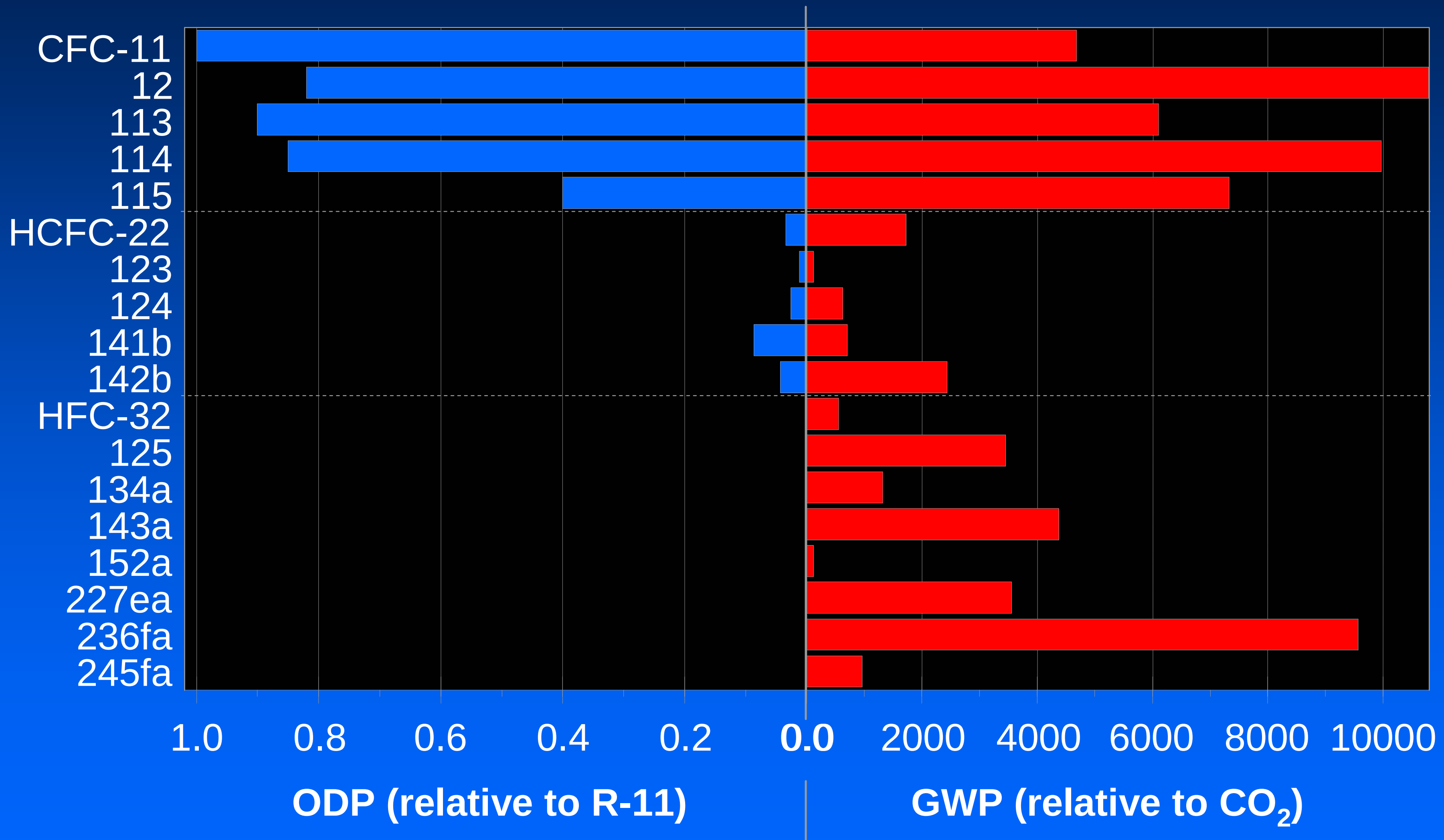
Ozone Depletion Potential (ODP)



Global Warming Potential (GWP)

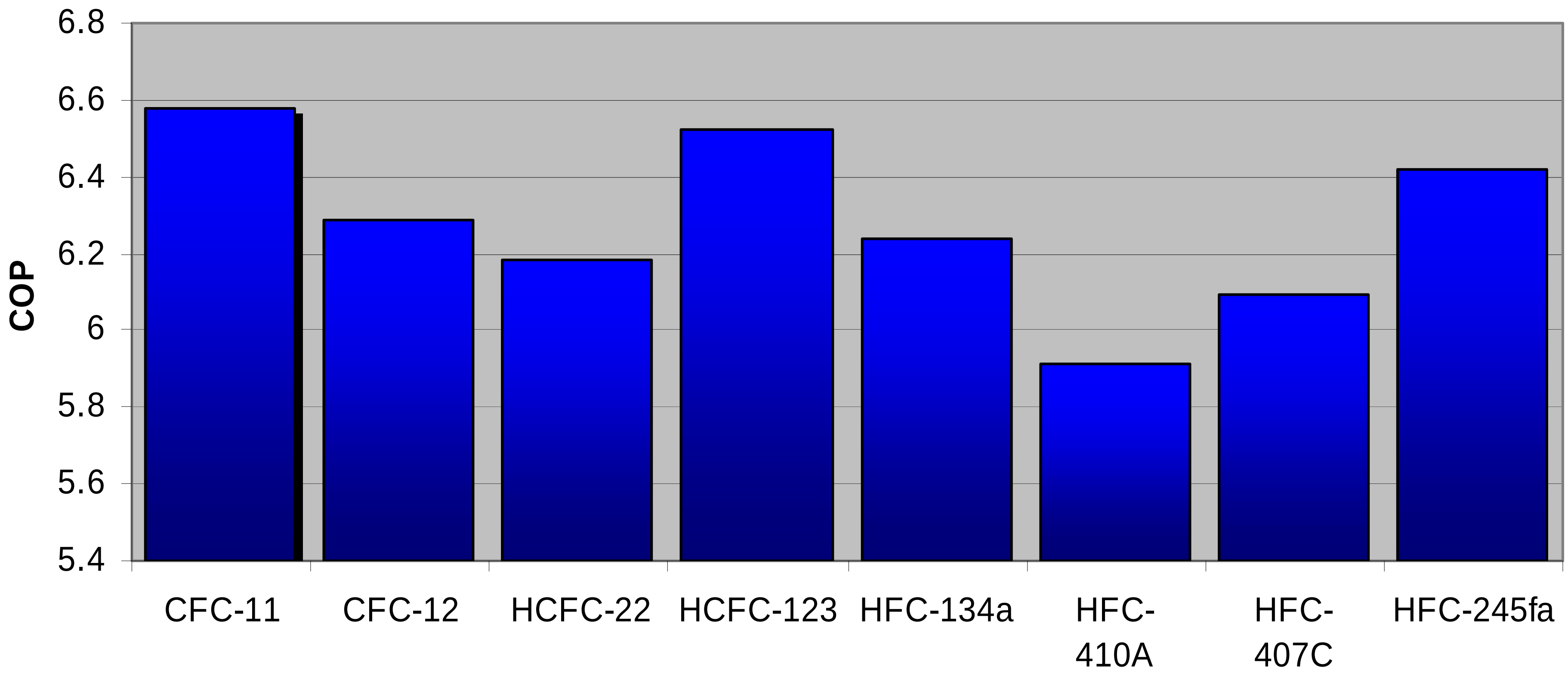


ODP versus GWP

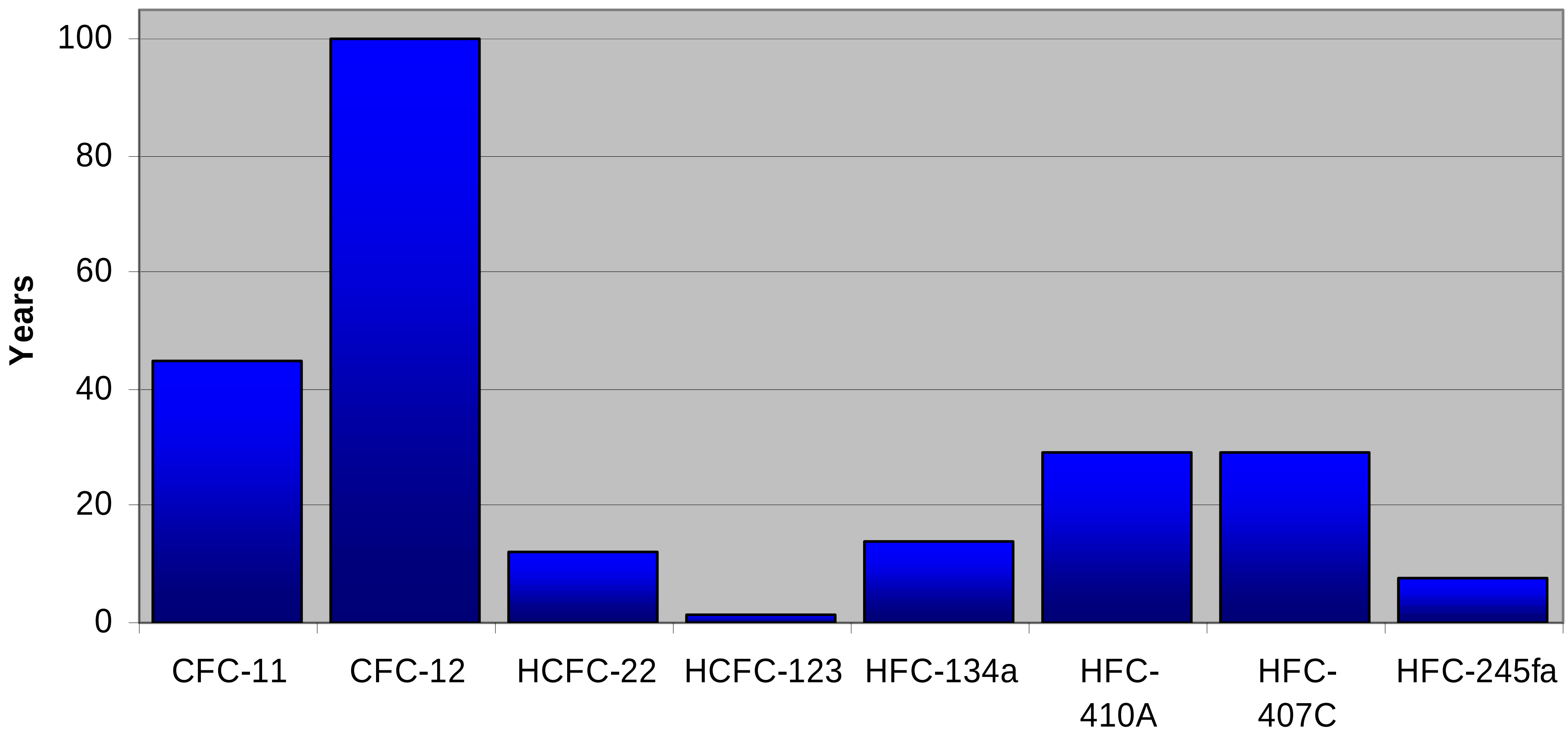


J. M. Calm and G. C. Hourahan, “Refrigerant Data Summary,” *Engineered Systems*, 18(11):74-88, November 2001 (based on 1998 WMO and 2001 IPCC assessments)

Efficiency for Chillers (COP)

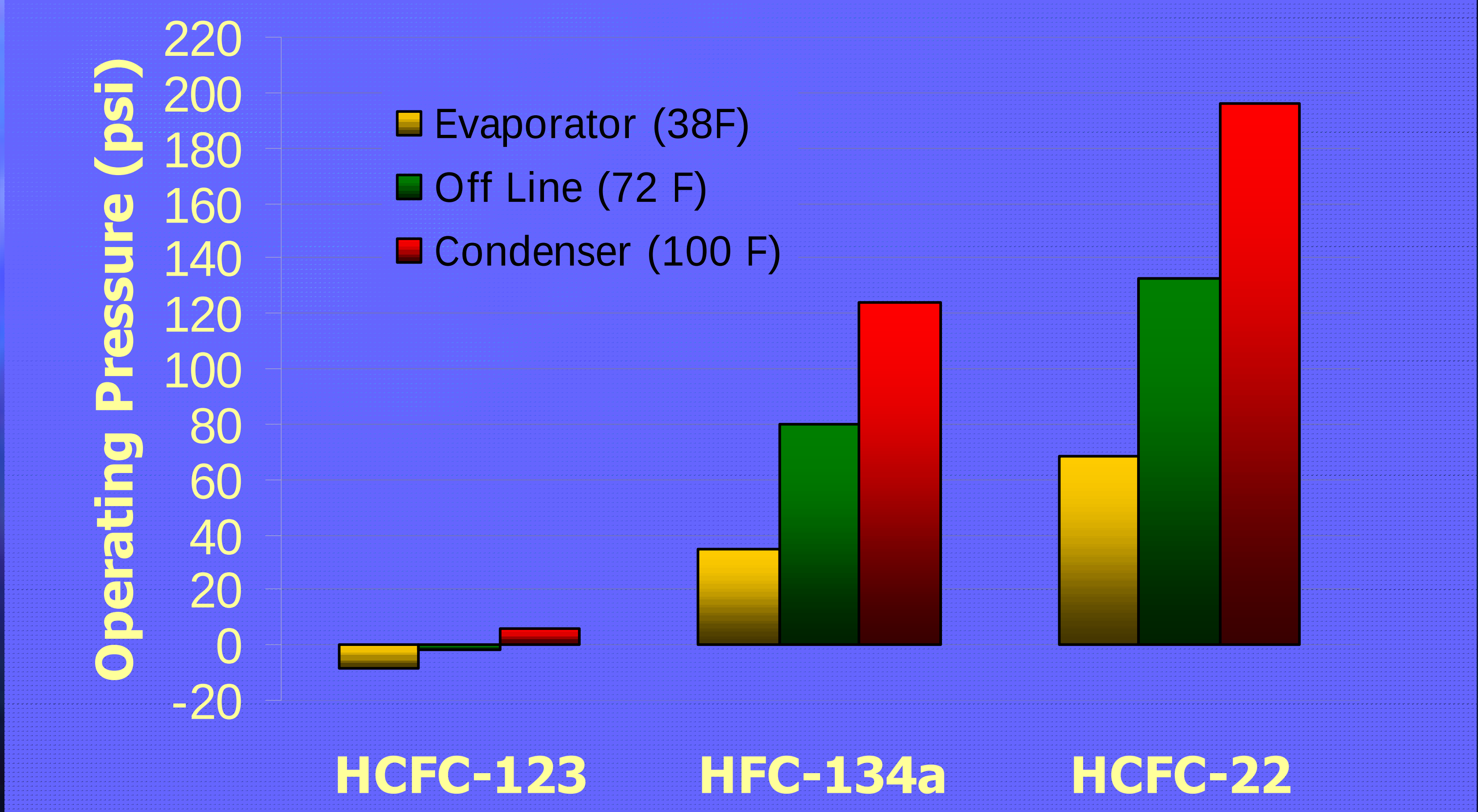


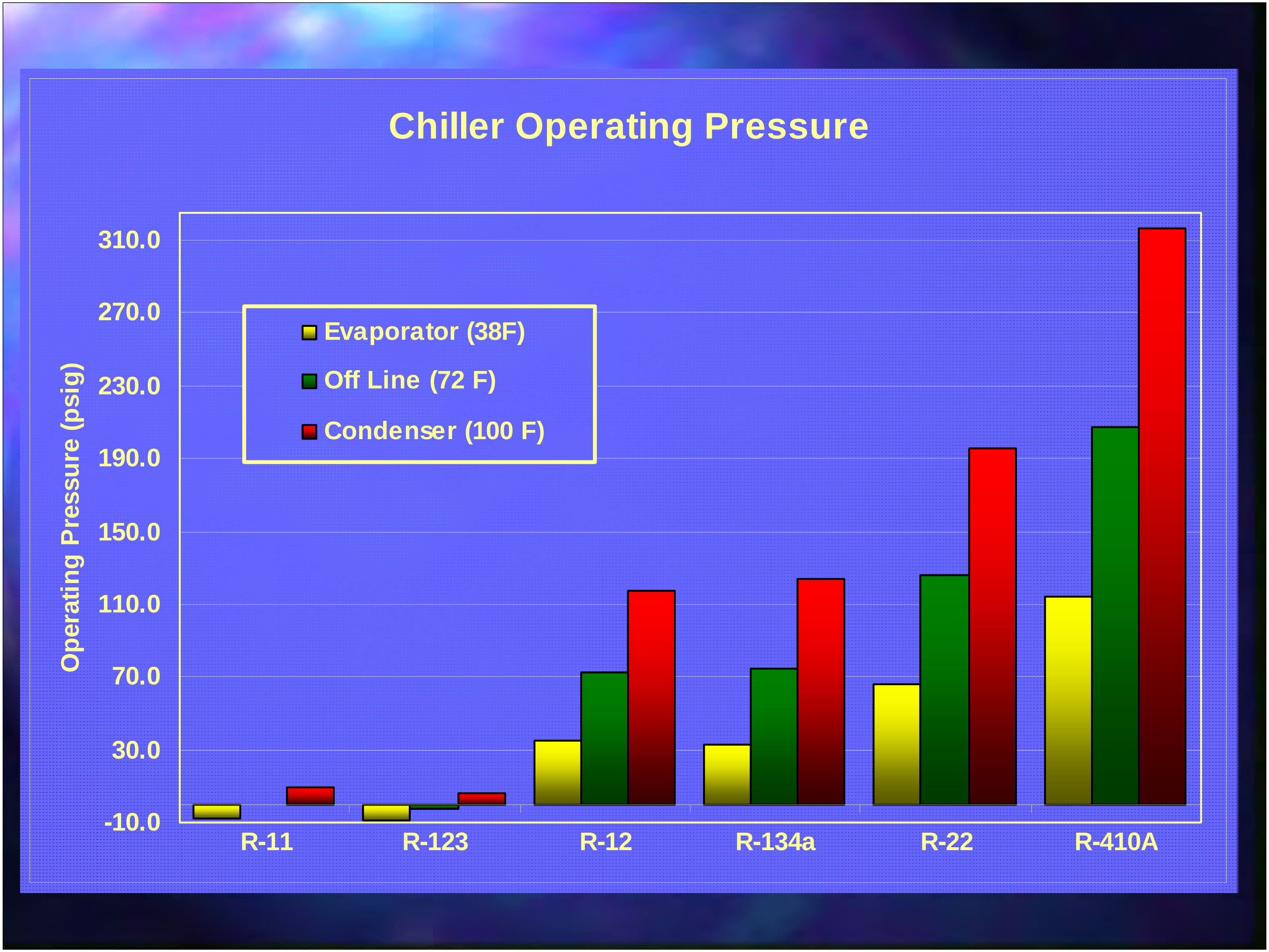
Atmospheric Life (Years)



*Atmospheric life of the R-125 component for R-410A, and R-407C blends

Operating Pressure





Chiller Operating Pressure
Evaporator (38F)
Off Line (72 F)
Condenser (100 F)
Operating Pressure (psig)
310.0
270.0
230.0
190.0
150.0
110.0
70.0
30.0
-10.0
R-11
R-123
R-12
R-134a
R-22
R-410A

Chiller Emissions Study

Number of Trane R-123 CenTraVacs	2768
Total Pounds of Charge	3,547,612 lbs
Total Pounds of Charge Added	16,229 lbs/yr
Annualized Total Loss Rate	0.4575 %

The Trane Company
1997 Survey Results

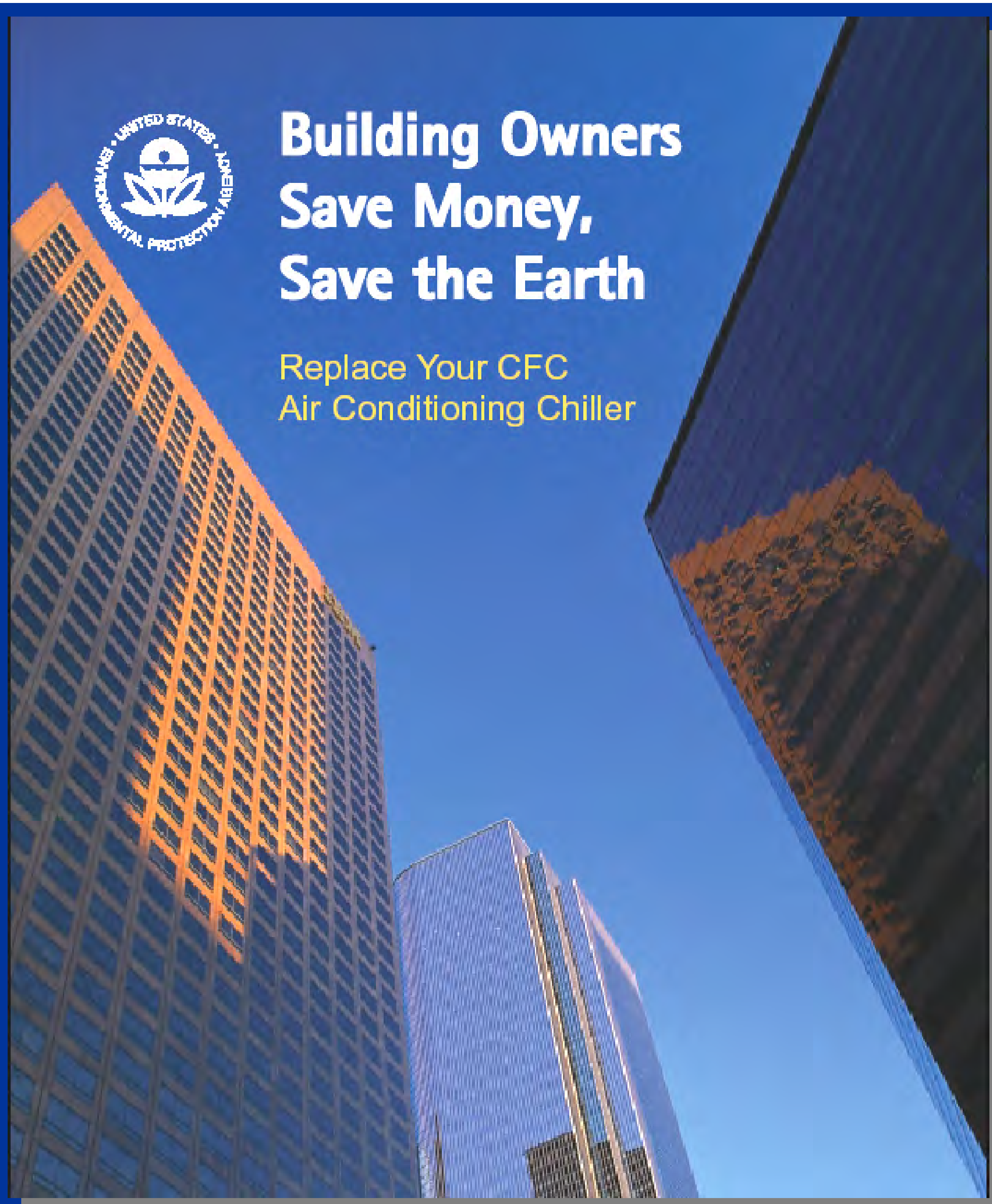
Study corroborated in "Impact on Global Ozone and Climate From Use and Emission of (HCFC-123)" By Calm, Wuebbles an Jain

The Future

Emissions

Energy Efficiency

Focusing on Emissions and Efficiency is fundamental to doing what's right.

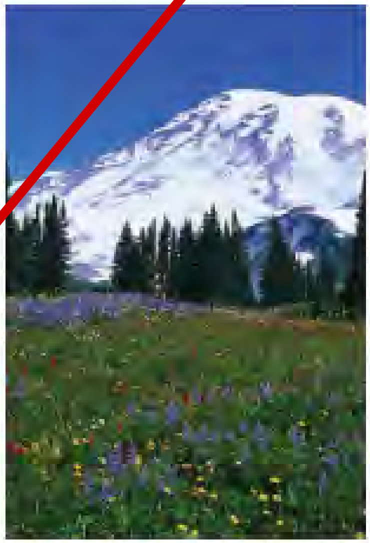

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Building Owners
Save Money,
Save the Earth
Replace Your CFC
Air Conditioning Chiller

achieve high energy efficiency and is ozone-safe, but refrigerant emissions are relatively potent greenhouse gases. HCFC-123 can achieve high energy efficiency and is not a potent greenhouse gas, but does have an ozone-depleting potential albeit low. Energy efficiency is the main environmental consideration in the selection of a chiller as long as the equipment is carefully maintained and refrigerant emissions are kept near zero.

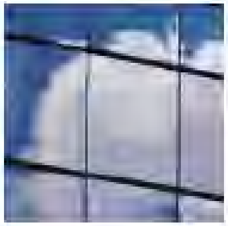
albeit low. Energy efficiency is the main environmental consideration in the selection of a chiller as long as the equipment is carefully maintained and refrigerant emissions are kept near zero.

Building owners can make a significant contribution to environmental protection by replacing old chillers. Properly monitored and maintained, high-efficiency HCFC-123 and HFC-134a chillers minimize the effect of air conditioning systems on climate change and do not significantly affect the ozone layer. By using less electricity, energy-efficient equipment helps protect the environment by reducing nitrous oxides, sulfur dioxide, particulate matter, carbon dioxide, and mercury emissions from power plants supplying electricity to the buildings.

Electric utilities sometimes use their least efficient power plants for the peak periods of electricity demand, which is when chiller loads are usually highest. Therefore, reduced electricity use has an even larger benefit for local air quality and climate protection.



Which Chiller Should I Purchase?



Several refrigerants are environmentally acceptable. However, if you want the highest environmental performance, follow the "Responsible Use" criteria, focusing on the Life-Cycle Climate Performance (LCCP), not the refrigerant. LCCP takes into account the emissions during the manufacturing of the refrigerant, the transportation to the site, during charging of the chiller, lifetime leakage, and finally during recovery and disposal. And, very importantly, this calculation must include emissions from the generation of electricity to power the chillers and account for any additional energy that may be necessary to assure safe operation. Insist that financial calculations consider both partial and full-load operation, that the performance of equipment based on alternate refrigerants is compared, and that available energy efficiency options are considered, including variable speed motor drives, heat recovery, and free-cooling. Select the investment with the best LCCP with emissions minimized.

Small-Scale Screw Chillers

New screw chiller technologies with high full- and part-load energy efficiency are replacing existing CFC centrifugal chillers primarily in the smaller tonnage ranges. These chillers are ideal for buildings with highly variable daily cooling loads. These screw chillers use a wide range of refrigerants including HCFC-22, HFC-134a, and the HFC blends R-407C and R-410A.

Medium- and Large-Scale Ammonia Chillers

Building owners will want to consider ammonia chillers using screw compressors where they can safely achieve higher energy efficiency. Emissions of ammonia refrigerants are ozone- and climate-safe, but because ammonia is toxic and moderately flammable, safety precautions are necessary. Ammonia is particularly attractive if higher efficiencies can be achieved for new installations involving ice-making, commercial refrigeration, cold storage warehouses, and in district cooling applications.

Large-Scale HCFC-123 and HFC-134a Centrifugal Chillers

For centrifugal chillers, choose either HCFC or HFC chillers with the highest cost-effective energy efficiency, and focus on maintaining the equipment's peak performance and minimal refrigerant emissions. Any refrigerant is environmentally safe as long as it is never emitted, and all refrigerants require careful handling to avoid worker exposure. By retrofitting or replacing chillers, emissions can be substantially reduced or eliminated. The goal of near-zero refrigerant emissions is possible with new equipment, modern refrigerant monitoring technology, and a proper maintenance program. Computerized controls and building automation systems can cost-effectively sustain and document the performance of the chiller plant.

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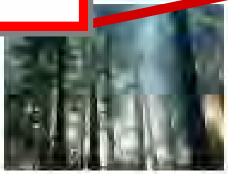

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Supporting Organizations

★ United Nations and World Bank
- United Nations Development Programme
- United Nations Environment Programme
- The World Bank

★ National Governments and Regional Authorities
- Australian Greenhouse Office
- Environment Canada
- Industry Canada
- Japan Ministry of Economy, Trade and Industry
- Japan Ministry of the Environment
- Singapore Ministry of the Environment
- Thailand, Department of Industrial Works, Ministry of Industry
- U.S. Environmental Protection Agency
- Vietnam National Office for Climate Change and Ozone Protection

★ Air Conditioning Equipment Manufacturers
- Carrier
- Daikin
- Lennox (Europe)
- McQuay
- Mitsubishi Heavy Industries
- Toshiba-Carrier
- Trane
- Turbocor
- York

★ Energy and Supply Companies
- Cryo-Line Supplies
- Exelon Services
- McKenney's Mechanical Contractors and Engineers
- Pacific Gas and Electric Company

★ Industry and Environmental Non-Governmental Organizations
- Air-Conditioning and Refrigeration Institute
- Alliance for Responsible Atmospheric Policy
- Alliance to Save Energy
- Americans for an Energy Efficient Economy
- Australian Fluorocarbon Council
- China Building Research Institute
- Ecole des Mines de Paris Center for Energy Studies
- Friends of the Earth
- Heating/Piping/Air Conditioning Engineering Magazine
- Heating, Refrigeration and Air Conditioning Institute of Canada
- Industrial Technology Research Institute
- International Climate Change Partnership
- Japan Industrial Conference for Ozone Layer Protection
- Japan Refrigeration and Air Conditioning Industry Association
- Natural Resources Defense Council

EPA-430-F-02-026

December 2002

Global Programs Division (6205J) and Climate Protection Partnerships Division (6202J)

www.epa.gov/ozone/

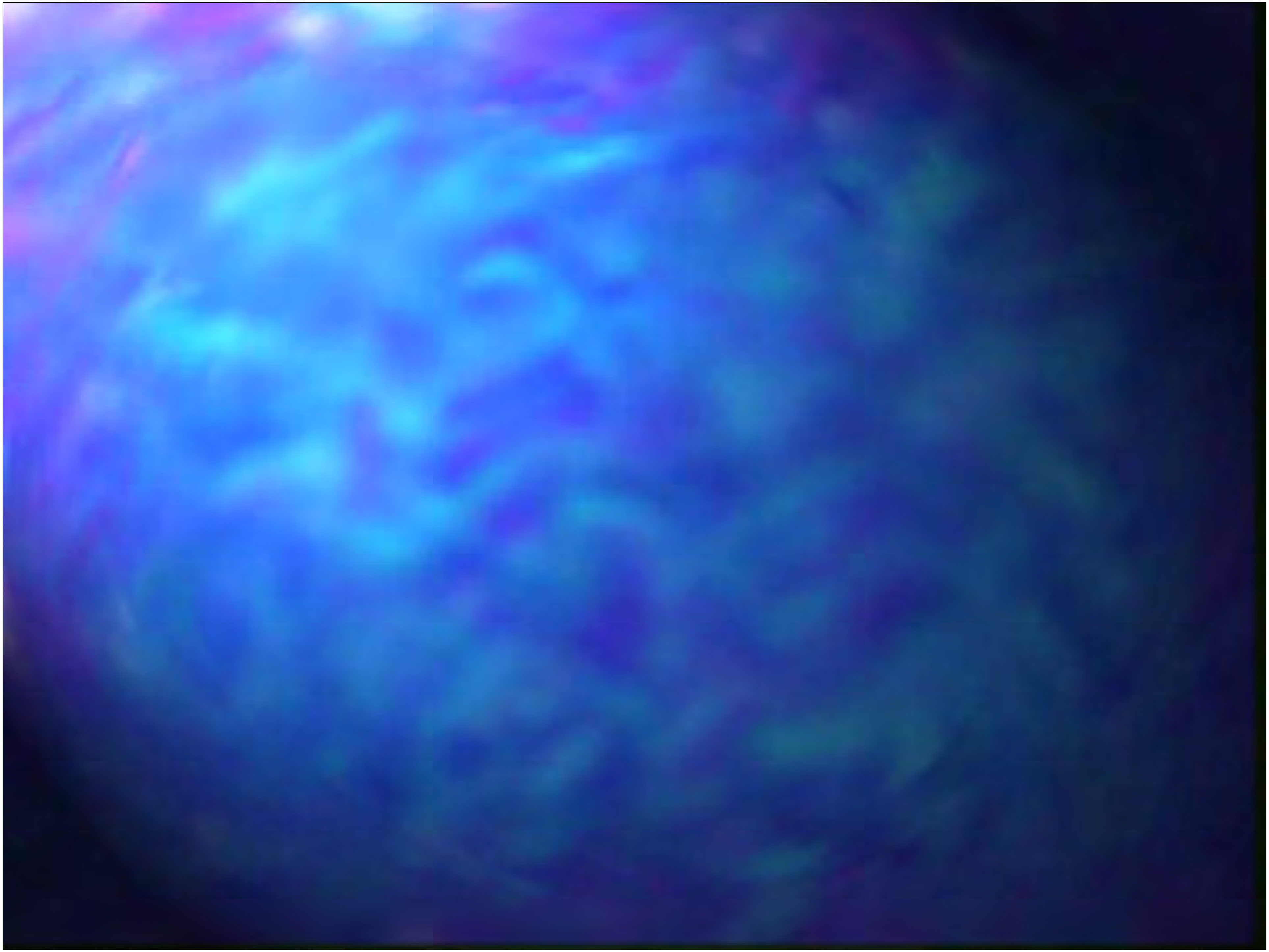
www.energystar.gov/

★ Air Conditioning Equipment Manufacturers
- Carrier
- Daikin
- Lennox (Europe)
- McQuay
- Mitsubishi Heavy Industries
- Toshiba-Carrier
- Trane
- Turbocor
- York

Summary

- There are global pressures on the use of all fluorocarbons
- The ODP of a refrigerant is not the only factor in determining impact on the environment
- The scientific community favors the use of high efficiency/low emissions products

Questions



LONWORKS Technology Update

Dave Schwenk
Engineer Research Development Center
Construction Engineering Research Laboratory
(ERDC-CERL)
Champaign, IL
1-800-USA-CERL, x7241
David.M.Schwenk@erdc.usace.army.mil

LONWORKS
Presentation Overview

- LonWorks Terminology & Overview
- UFGS and UFC status
- LonWorks Benefits
- Lessons Learned
- UMCS/DDC Plan
- LonMark – What's new

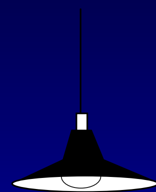
Terminology

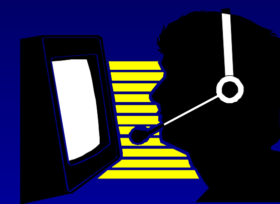
- LonWorks®: General term for the technology related to the ANSI-709.1 protocol
- ANSI-709.1: Standard communications protocol; a set of rules for communication between devices
- LonTalk®: Name for the Echelon implementation of ANSI-709.1 on a Neuron® chip
- ANSI/EIA-852: Standard for using ANSI-709.1 communications over an IP Network

Terminology

- LonMark® International: An industry organization that develops Interoperability Guidelines and certifies LONWORKS devices
- LonMark Certification:
- LONWORKS® Network Services (LNS™): A network management and database standard developed by the Echelon Corporation

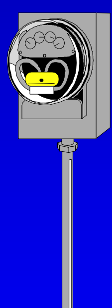
LONWORKS Applications





- HVAC controls
- Lighting
- Power management
- Remote monitoring
- Electric sub-metering

- Access control
- Security
- Elevators
- Fire/life safety

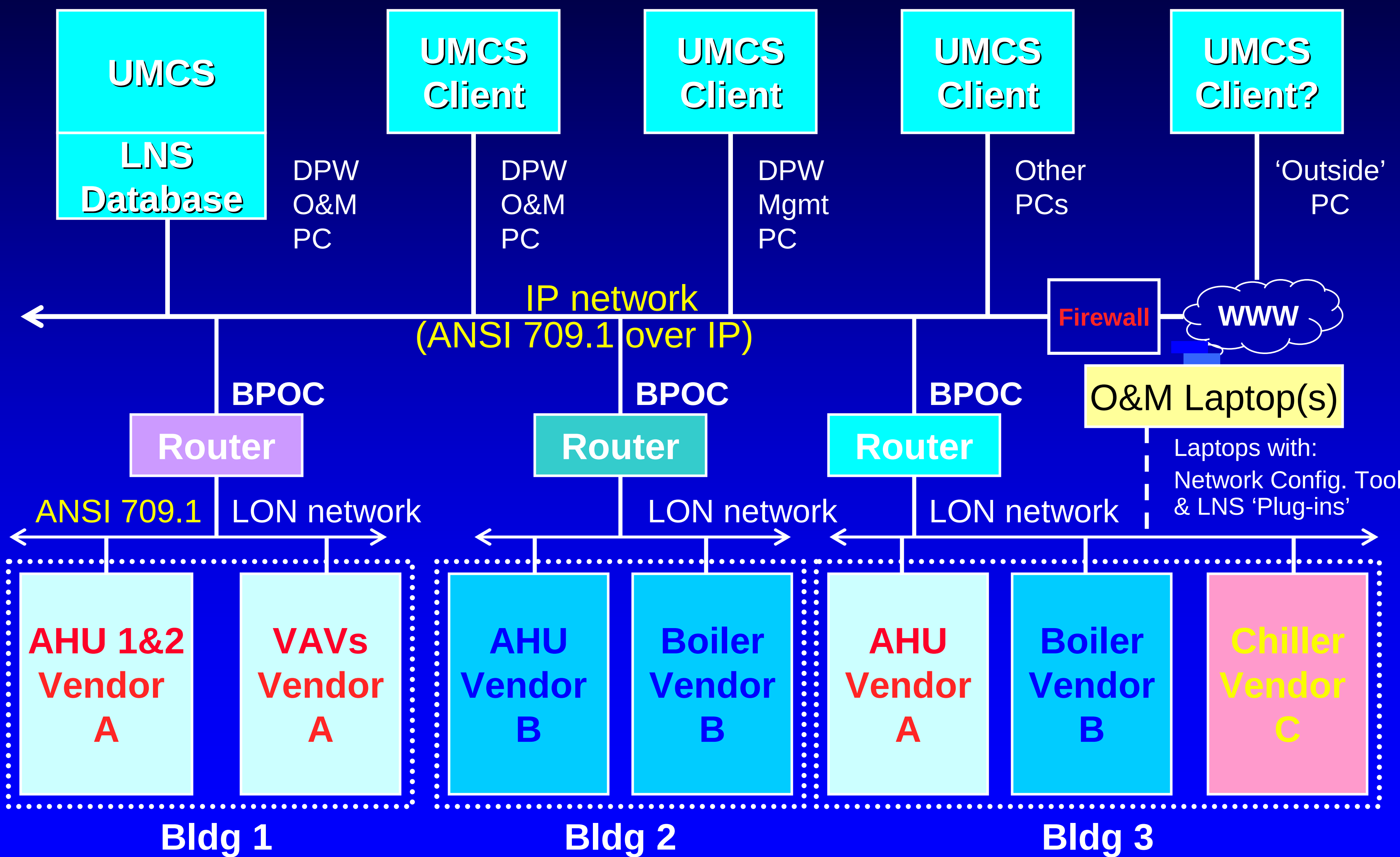


Only HVAC controls are included in the current design and specification criteria. Metering/Power Mgmt are ‘supported’.

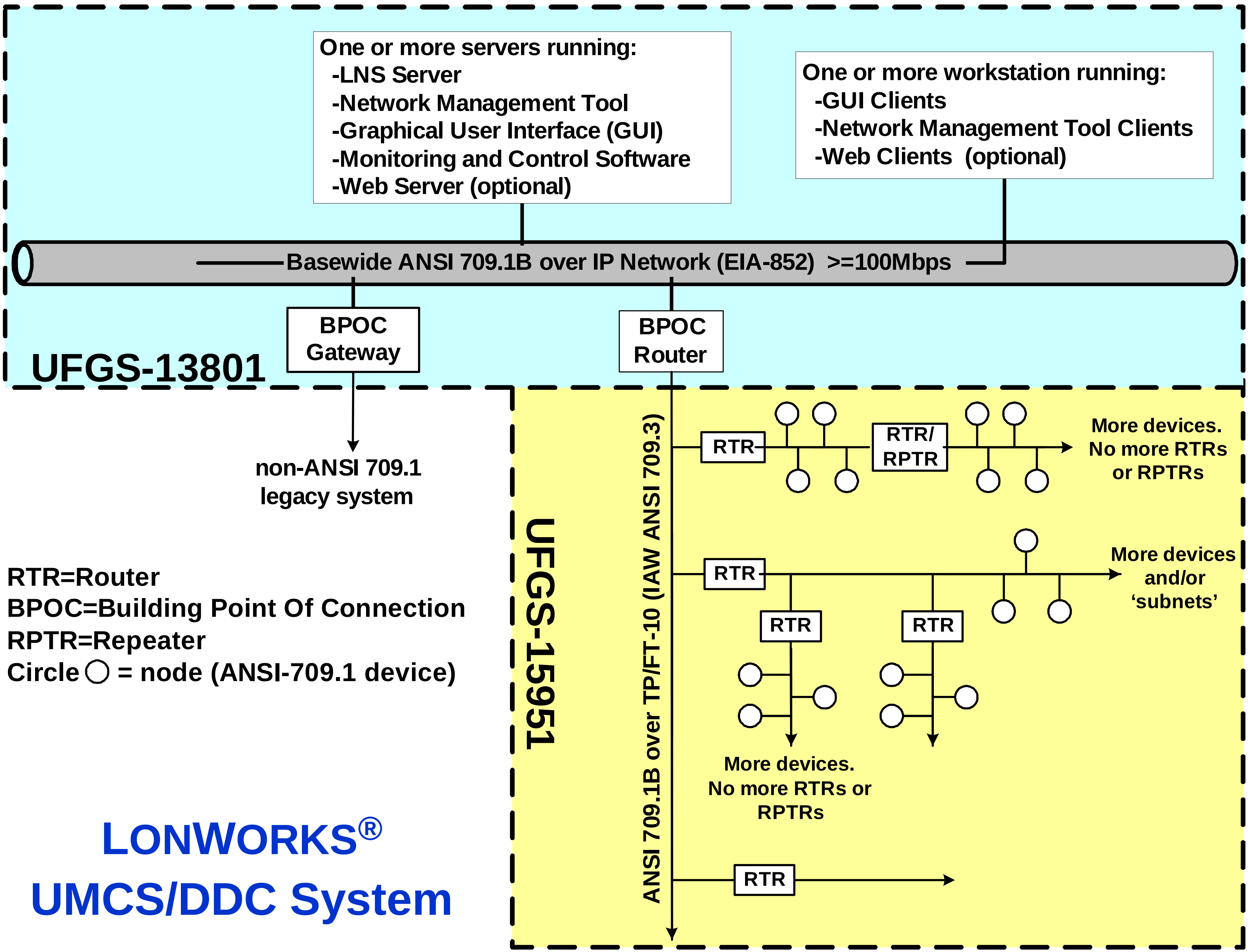
UMCS & DDC

- Utility Monitoring and Control System (UMCS)
  - Specification: **UFGS-13801**
  - Central supervisory monitoring and control system
  - Interface to one or more multi-vendor building-level DDC systems
  - Unlike the old EMCS specs, does not specify/include the building-level controls
- Direct Digital Control For HVAC & Other Local Building Systems
  - Specification: **UFGS-15951**
  - Building-Level control systems and communications network (based on ANSI-709.1 communications protocol)
  - Focus is on HVAC controls (but supports other technologies)

LONWORKS® UMCS/DDC - Overview



BPOC=Building Point of Connection (UMCS to Building Control Network)

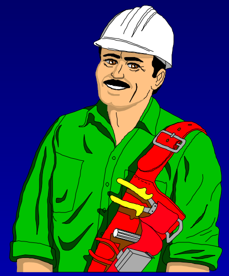

One or more servers running:
-LNS Server
-Network Management Tool
-Graphical User Interface (GUI)
-Monitoring and Control Software
-Web Server (optional)
One or more workstation running:
-GUI Clients
-Network Management Tool Clients
-Web Clients (optional)
Basewide ANSI 709.1B over IP Network (EIA-852) >=100Mbps
BPOC Gateway
BPOC Router
UFGS-13801
non-ANSI 709.1 legacy system
UFGS-15951
ANSI 709.1B over TP/FT-10 (IAW ANSI 709.3)
RTR
RTR/ RPTR
More devices. No more RTRs or RPTRs
RTR
More devices and/or 'subnets'
RTR
RTR
More devices. No more RTRs or RPTRs
RTR
RTR=Router
BPOC=Building Point Of Connection
RPTR=Repeater
Circle ◯ = node (ANSI-709.1 device)
LONWORKS®
UMCS/DDC System

LONWORKS – UFGS & UFC Status

- Specs: UFGS-15951 & 13801 released FY04
- Draft UFCs http://www.cecer.army.mil/KD/HVAC/
  - UMCS DDC System Overview
  - Project Implementation Summary
  - Control System ACAD dwgs (A/E/C CAD Std 2.0 compliant)
  - Points Schedule (drawing) Instructions
  - AutoCAD Drawing User's Guide
- PROSPECT Training (Crs 094, 340, and 382)

LONWORKS Benefits

- UMCS front-end provides opportunity to better manage facilities/buildings
  - Monitoring capability, alarms, scheduling, etc.
  - Support for technologies other than HVAC
- Use of a single Network Configuration Tool
  - Helps O&M staff to be more effective
  - Will minimize training needs over the long term



- Simplifies the overall mix of softwares, dongles, and controllers (simpler for both construction and O&M staff)
- Supports open competition, but will likely limit the mix and variations of DDC
- Provides choice/options in replacing substandard controls (due to standard '*building control network'*)

LONWORKS Installations

- Fort Sill
- Fort Hood
- Sheppard AFB
- Fort Bragg – Planning stage
- Fort Stewart – Planning stage

- Successful projects use a long-term-contracted **Systems Integrator** to execute UFGS-13801 requirements via Huntsville IDIQ, local IDIQ, or ESPC contract mechanism

LONWORKS Lessons Learned

Most importantly…

You really do need a plan

UMCS/DDC Plan

- Select, define, & document a strategy/plan, including how to…
- Find a **System Integrator** (SI) to manage front-end
- Obtain LONWORKS® **UMCS front-end** software package
- Obtain **LNS™ Network Tool** (software)
- Require LONWORKS controls for all building-level projects
- Identify Contractors/products that meet LONWORKS reqmts
- Define in-house (Govt.) support mechanisms/strategy
- Coordinate with DOIM (Important & must be done early!)

Fort Bragg's plan is described in Technical Report.
Contact David.M.Schwenk@erdc.usace.army.mil

LONWORKS Lessons Learned

- Application specific controllers (ASC)
  - Prevalent in the Lon 'World'
  - Simple. O&M folks love them compared to programmable.
  - Dumb down your control schemes to get ASCs. Permit contractors to submit alternate control sequences.
- LonWorks Network Services (LNS) platform
  - Used to launch/configure multiple vendors ASCs using 'plug-in'
- ASC's with LNS plug-ins:
  - Circon, Distech, Honeywell, Johnson Controls, TAC
  - Lots of others (for lighting, power management, etc.)
- Insist on LNS and LNS plug-ins
  - Enforce specs. Minimizes software tools. Simplifies O&M.

LONWORKS Lessons Learned

- Open systems involves complexity
  - Welcome to the world of interoperability
  - All controls are complex. Pick your poison.
  - Government competitive procurement rules dictates need for open systems
  - LonWorks/open systems not a silver bullet. But with UFGS much of the work has been done for you.
- Trend toward networked systems will continue
  - Networked systems and controls are complex
  - We need to get used to it and get a grip
  - Networking requires DOIM involvement. Get to know them.
  - Evolving security issues & requirements (i.e. 'Networthiness')
  - On plus side: Guidance, training, expertise available

LONWORKS Lessons Learned

- IP network security:
  - Army “Networthiness” requirements
  - New. Based out of Fort Huachuka.
  - 79 item checklist. ~80 manhour effort by Contractor.
  - Networthiness Certificate issued to ‘system’
  - Can **avoid** if IP network is dedicated to UMCS/DDC

LONWORKS Lessons Learned

- LonWorks weak on some supervisory functions
  - Scheduling (occ/unocc etc.). UFGS is very prescriptive to provided necessary functionality.
  - Alarms: LonWorks supports, but not efficient.
  - Trends: Bulk data transfer not standardized. Front-end PC used to capture trend data.
  - On plus side: Don't always have need for supervisory functions and LonWorks negates the need for beefy proprietary building controllers that would otherwise perform these functions

LONWORKS Lessons Learned

- You will need a System Integrator (SI)
  - Original intent. Executes UFGS-13801 requirements.
  - Obtain through Huntsville IDIQ contract or local sources
  - A list of SI's: http://osa.echelon.com/Solutions/FindNI.htm
- Don't let 15951 Contractors give you front-end software with each new project. Use UFGS-13801 (existing front-end software) and SI services.
- Your alternative? Proprietary systems: Use UFGS-15910A (Navy spec) or dust off old UFGS-15951A.

UMCS Front-end & Network Configuration Tool
(Acceptable* Vendors)

- **UMCS front-end** software vendors*
  - **Circon** (<u>Visual Integrator 3</u>)
  - **Honeywell** (<u>EBI or SmmetrE</u>)
  - **Wonderware** (<u>Intouch</u>)
  - ***Intellution*** *(FIX)*
  - **TAC** (<u>VISTA</u>)
- **LNS Network Tool** vendors*
  - **Circon** (<u>Network Integrator</u>)
  - ***Honeywell*** *(CARE 4.0)* *{Writes LNS, but not doesn't use/read LNS}*
  - **Richards Zeta** (PerfectHOST for LNS)
  - **Visual Control** (VC Network Manager)
  - **Echelon** (<u>LonMaker</u>) *{TAC uses this tool}*
  - **Distech** (LonWatcher)
  - **Johnson Controls** (MCL Tool) *{Not on Echelon** Website}*

*Incomplete list. Others may be acceptable. <u>Underlined</u>=More confidence
**http://www.echelon.com/products/development/lns/pwrtools.htm

LONMARK – What's New

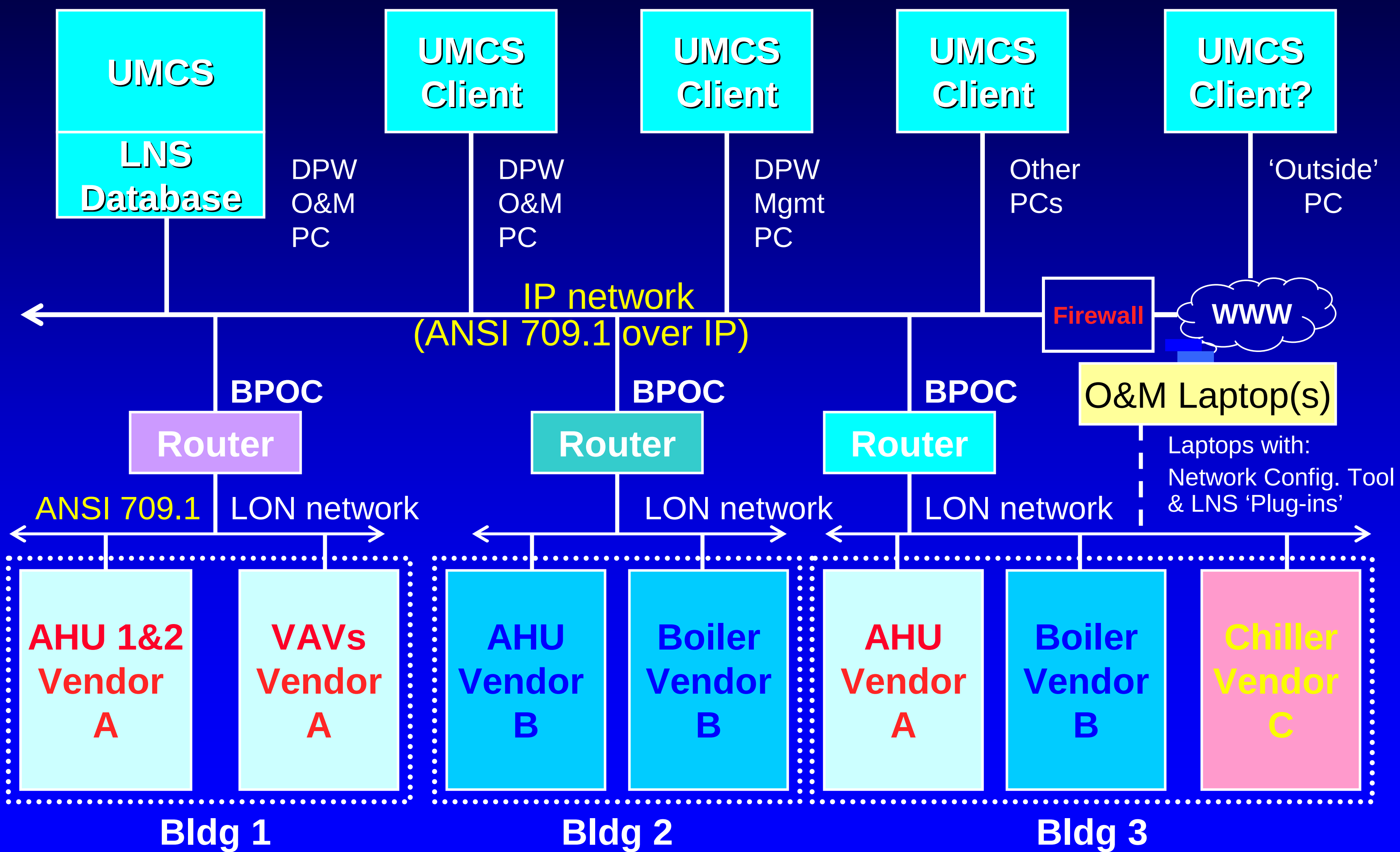
- Over 670 products have been LonMark certified to date
- 'Utility Meter' Functional Profile (FP)
- Developing an Open Spec template
  - May provide perspective (comparison to UFGS) / options
- Systems integrator testing/certification program being developed to improve the quality & availability of integrators

LONWORKS Summary

- Open systems provide non-proprietary options
  - Big benefit & Must adhere to procurement rules.
- Our challenges…
  - Building Automation Systems (controls) aren't rocket science, but are far from simple. Always have been always will be.
  - Open systems are not turn-key. Proprietary systems can be but the Vendor/Contractor owns the key.
  - Most DDC vendors not willing to provide open systems
    - Technology and 'know how' exist, but openness is not their goal
    - There are Exceptions (1 or 2 vendors and System Integrators)
- Develop a plan
  - Need a vision/goal. Controls require attention.

Duplicate slides…

LONWORKS® UMCS/DDC - Overview



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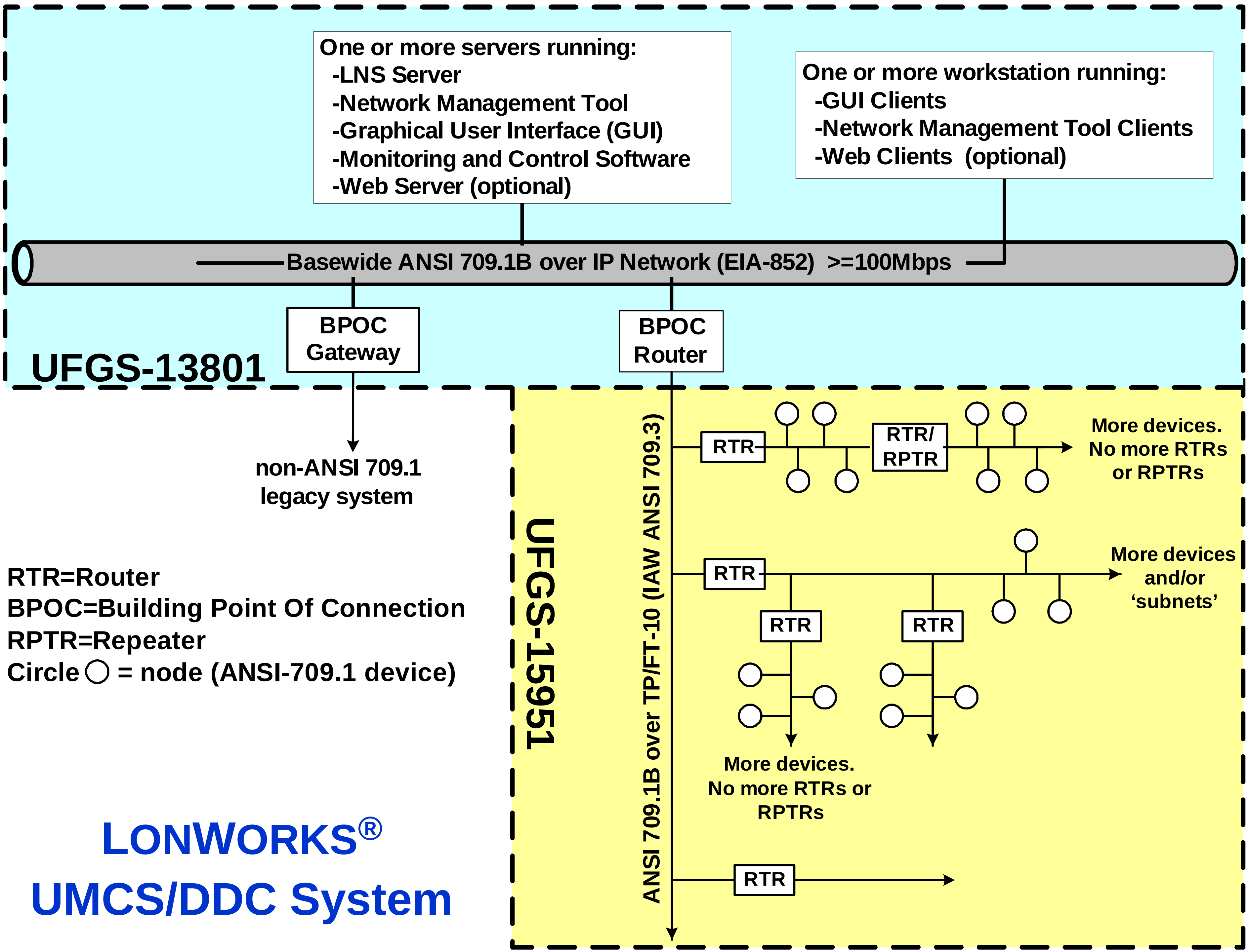
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RTR

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Tri-Service Infrastructure 2005

Implementation of Lon-Based Specifications

Will White - Chris Newman

U.S. Army Corps of Engineers,
Huntsville Engineering & Support Center

U.S. Army Corps of Engineers
Huntsville Center

Discussion Outline

Open Systems

- Design
- Specifications
- Execution
- Challenges

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LonWorks

- Let the buyer be aware

- LonWorks provides a method for a building owner to purchase building automation controls from multiple vendors that can integrate with your existing base wide network and base wide "head end"...

..........................BUT.........................

The devil is IN the details

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Open Systems

- No standard definition for an open system

Here's one: One that is easily modified: where components (hardware and software) may be acquired from multiple sources and are readily added to or removed by not only the original installer but also by others after the original installation.

- There is MUCH more to open systems that just using a open protocol

- Ensuring 'Openness' is HARD work, but most of the work has been done, what's left is to enforce the specifications (UFGS-13801 & 15951)

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- Implementation at Fort Sill, OK.

  16 buildings ~ $1.3M

- Intent is to purchase a DDC system so that the 'Head-End' can be replaced without making hardware/software changes at the building level.
  - Maintaining an 'Open System' access to Time Schedules, Alarms, Manual Functions & Trending

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Design

Make a Plan

You need a good picture in mind of what you need

System Architecture

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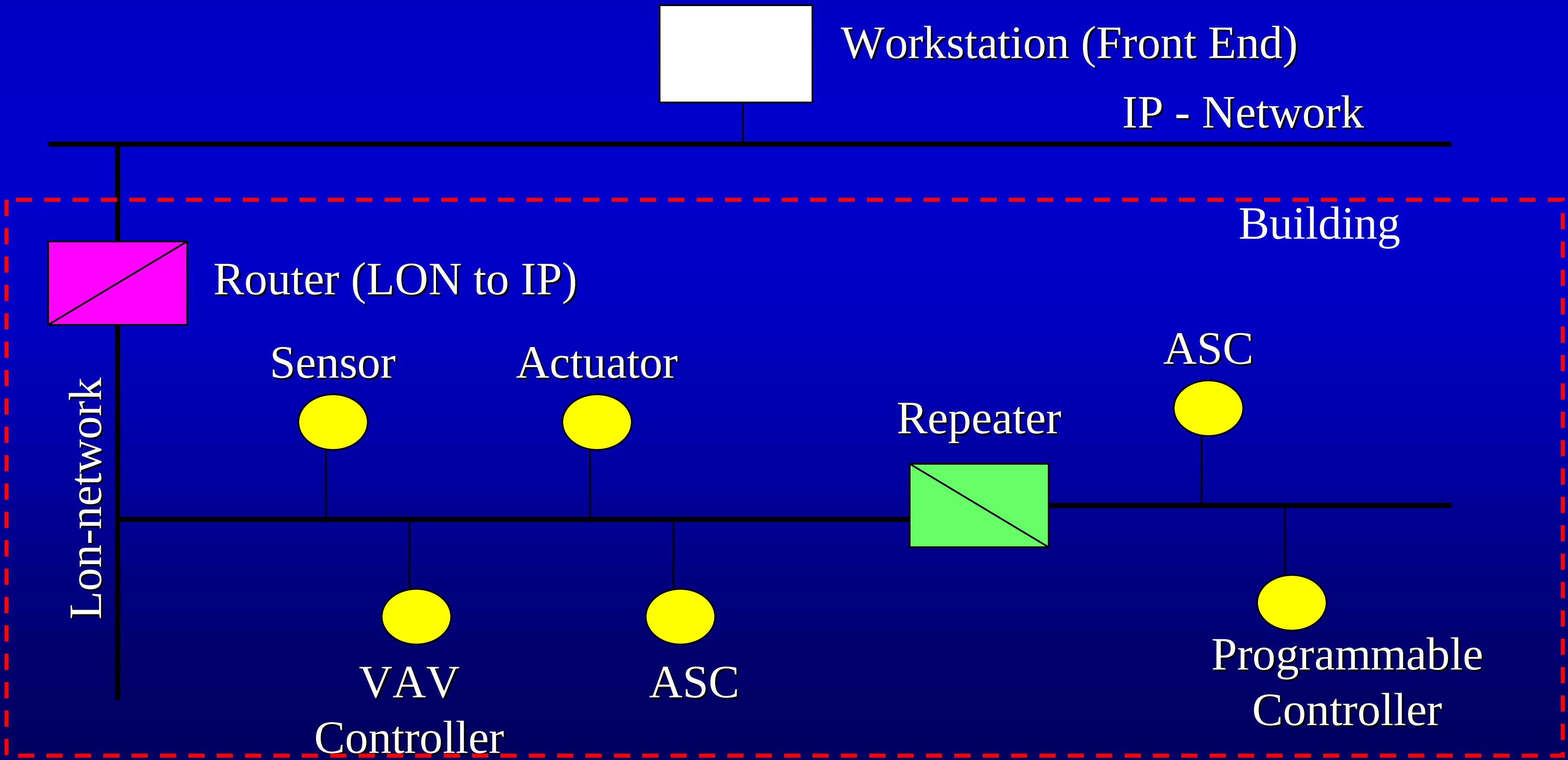
System Architecture



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Design

- Most control vendors perform, Scheduling, Alarm Handling & Manual Functions in a proprietary method, EVEN on an “Open” System
- The Guide Specs include requirements that these be done in a specific and Open manner, using Standard Network Variable Types (SNVTs), allowing another control vendor to access all these functions

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Design

- "Kinky SNVTs" – improper use of SNVTs

– when a controls vendor violates the SNVT data format standards.

Example: using a snvt_amp to transfer a temperature, instead of the proper SNVT snvt_temp_p.

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Specifications

- Two General Types of Controllers:
  - Application Specific Controllers (ASC)
  - General Purpose Programmable Controllers (GPPC)
- The preferred type is ASC's

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Specifications

- Unless the Government makes an exception, all Application Specific Controllers (ASC) shall have plug-ins which must be supplied by the controls vendor
- Plug-In – software tool that gives you a better look and feel to configure an ASC.

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Specifications

- Programmable Controllers
  - Permitted in the project
  - Need not be LonMark Certified
  - Needs to conform to the LonMark Interoperability Guidelines
  - Ensure there are sufficient numbers of SNVTs (input and output) available to fulfill its function.
  - Ensure all SNVTs are defined in the Points Schedule

Specification

- The Programmable Controllers are most easily replaced with the same make/model of controller (this allows the reuse of the program)

- If another vendor’s programmable controller is used, it will require new programming for it to perform the same functions as the old unit… but then it can be wired right into the existing network.

Specifications

- Manual overrides of inputs/outputs (good for test mode use) are not always available. All of the output manual overrides are a requirement of the current specification, Inputs are not.
- Be aware of the advantages of exercising the manual overrides.

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Execution

- **Some Point Schedule Requirements – (DRAFT UFCs)** **http://www.cecer.army.mil/KD/HVAC/**
- **Shows device addresses**
- **Shows device configuration settings**
- **Shows Graphical User Interface (GUI) Points**
  - **Alarms**
  - **Trending**
  - **Scheduling**
- **Shows variables that are available on the network**
- **Shows which points are available for manual functions (overrides)**

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Execution

- <u>Ensure</u> that your controls contractor provides the network configuration software tool (UFGS-13801)
- <u>Ensure</u> that the devices and head-end conform to and utilize an LNS database (Beware! Some vendors convert an LNS database to a proprietary format)

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Execution

- Establish Master Plan
- Get Smart – find training opportunities
  - Prospect Courses (Design 340, QV 382, UMCS 094)
- Ensure qualified QA people are available to witness verification testing

Challenges

- The control vendors, given their choice, would rather sell you a proprietary system.

- Ensuring that the final product is truly ‘Open’ demands attention to <u>many</u> details (just because it “talks” LonTalk does not make it an ‘Open System’).

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Challenges

- New Building Integration Issues:
  - Different vendors, tools and software
  - Backup the LNS Database BEFORE any new integration and after successful commissioning
- Insist on complete interface documentation. No finger pointing allowed.
  - Point Schedule (<u>Very</u> Important!)
  - LNS Database

Challenges

- Clarify who is in charge of the network. One may step on the other and lose data.
- New buildings and addressing schemes
  – node and domain addressing
      - no undo button.

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Challenges

Directorate of Information Management (DOIM)

- Critical element in the success of your project – involve them EARLY in the project
- Increased network security requirements
- Networthiness – undefined policy / requirements
- Fee for IP drops – budget/cost issue?
- Alternative - dedicated DDC network – cost?

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Summary

- To succeed with Open Systems:
  - Use and enforce the specifications
  - Make a plan
  - Seek qualified people, training and vendors
  - Test, Test, Test
  - Send flowers to DOIM

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Questions?